Investigating visual communication in relation to graphical form using symbols for the International Red Cross and Red Crescent Movement

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Abstract

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INVESTIGATING VISUAL COMMUNICATION IN RELATION TO GRAPHICAL FORM USING SYMBOLS FOR THE INTERNATIONAL RED CROSS AND RED CRESCENT MOVEMENT

A problem related to the religious connotations of current emblems for the International Red Cross and Red Crescent Movement which had led to a new symbol proposal in 2000 presented an opportunity to examine the comparative effectiveness of pictorial, schematic, and abstract symbols; to assess the tenability of Saussure's signifier-signified arbitrary sign relationship in the context of visual representations; to validate Peirce's semiotic theories of iconicity, indexicality, and symbolicity in relation to graphical symbol form; to gauge the utility of ISO 9186: 2001 in a new context; and to evaluate the suitability of current and proposed symbols to represent visually key attributes of the movement.

Five studies involving 396 participants were carried out in Kenya and the UK. Correspondence ratings between pictorial-to-abstract symbols and concrete-to-abstract attributes appeared to be visually and semantically motivated; symbol semiosis was interpreted to be simultaneously iconic and indexical; therefore the symbol-referent relationship appeared to be non-arbitrary. Mean comprehensibility judgement test scores differed significantly between familiar and unfamiliar symbols but not between symbols of differing graphical form. Symbol meanings in the open-ended comprehension test appeared to be derived mainly from iconic and symbolic readings of individual symbols.

Whereas pictorial, schematic, and abstract graphical characteristics represent the material and perceptual differences between symbols, the semiosis of these apparently differing graphical forms overlaps to the extent that graphical form has limited functional utility. That notwithstanding, by analysing the semiosis of symbols of differing graphical forms, one has the potential to gauge with greater accuracy symbol functioning, and hence recommend specific symbol types for specific uses.

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1 Introduction

1.1 Background

The Red Cross was proposed as the emblem for the International Red Cross and Red Crescent Movement (the movement[1]) at its founding in Geneva in 1863. The Ottoman Empire opted to use the Red Crescent in place of the Red Cross during the Russo-Turkish war of 1876-1878 (Bugnion, 2000: 7-12), a decision not devoid of religious, cultural, and political overtones (Kosuge, 2003: 75-76). The Red Crescent, and Red Lion and Sun, the latter used by Persia and its successor Iran until 1980, were recognised as additional official emblems in 1929 (Bugnion, 2000: 13-18). A new emblem, 'the red crystal' (Forster, 2001: 1159), was developed to avoid the religious connotations of the Cross and Crescent (see Bugnion, 1977, 2000; Kosuge, 2003; Sommaruga, 1992).

Figure 1.1: The Red Cross, Red Crescent, and Red Lion and Sun, the official emblems of the International Red Cross and Red Crescent Movement, and the new proposal, the Red Crystal.

The Red Crystal (Figure 1.1) is conceived as a compound symbol within which National Societies that have reservations about using the official emblems can place their devices (International Committee of the Red Cross, 2000: 2-3), for example, the Israeli Red Shield of David (Magen David Adom). In effect the movement, in spite of its name, has a potentially indefinite configuration of visual representations. The unique and principal work of the movement, that of offering assistance to the victims of war, including combatants, with the implicit demands for neutrality and visibility that this entails, makes this lack of visual coherency an unacceptably confusing and potentially dangerous situation.

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[1] The movement comprises the International Committee of the Red Cross (ICRC), the International Federation of Red Cross and Red Crescent Societies, and autonomous National Red Cross and Red Crescent Societies (there were 181 of these as of 21 November 2003).

1.2 Research objectives

1.2.1 Abstract symbols are devoid of pre-existing connotations

A review of several authors (Arnheim, 1970; Blackwell & Engelhardt, 2002; Dondis, 1973; Eliot, 1960; Familant & Detweiler, 1993; Frutiger, 1989; Hakiel & Easterby, 1984; Kazmierczak, 2000/2001; Krampen, 1965; Modley, 1966; Moriarty, 1985; Richards, 2000) indicates that the current emblems may be classified as "pictorial" and the proposed symbol "abstract" (see Table 2.2). This suggests the deliberate adoption of an abstract symbol on this occasion, presumably to avoid the unhelpful connotations engendered by the current pictorial symbols. Indeed, Foster[2] has suggested that 'tests will demonstrate that [abstract symbols have] no prior meaning … establish[ing] that one is starting with a "clean" symbol with no pre-existing connotations'. The implicit assumption is that abstract symbols, unlike their pictorial alternatives, are devoid of 'pre-existing connotations'. The pictorial-to-abstract characteristics of the current and proposed symbols presented an ideal situation to test this proposition.

The literature review revealed a large body of research on graphical symbols, and the suggestion that pictorial symbols are not entirely free of 'pre-existing connotations' is well founded. Indeed, much effort in graphical symbols research is devoted to uncovering these connotations so as to avoid using symbols that are unsuited to their specified functions. What appears to be in short supply, however, are studies which evaluate symbols of differing graphical forms (but representing the same information) to examine which graphical form is, indeed, "cleaner" than the other with regard to extraneous symbol interpretation, or which graphical form is more effective, comparatively, in representing and communicating information visually. In other words, even if we were to accept the observation that abstract

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[2] Email from Dr. Jeremy J. Foster, Manchester Metropolitan University, to this author in response to the Red Crystal proposal, 8 February 2002.

symbols are relatively free of 'pre-existing connotations', there would still be the need to determine if abstract symbols are effective vehicles for information representation and communication.

Tied in with this objective was an attempt to validate by empirical means the claims of religious connotations with regard to the Cross and Crescent symbols in the context of the International Red Cross and Red Crescent Movement (Bugnion, 1977, 2000; Kosuge, 2003; Sommaruga, 1992). There is no evidence to indicate that this has been done before, which would appear to be a significant omission, given the religious genesis of the problems which have attended the movement's current symbols for close to 140 years.

1.2.2 Design methods to constrain symbol interpretation

Firth (1973) wrote: 'If a symbol is to be an effective instrument of communication, it is essential that it should convey much the same thing to [the] people involved … [and] the range of variation in their interpretations should not inhibit the action desired' (p. 81). Firth writes from an anthropologist's point of view, where symbols are considered 'stores of meaning' and 'cultural assets' (op. cit.), among other things. Nonetheless, inserting the words *graphical* before 'symbol' and *visual* before 'communication' makes this observation relevant to this study. Thus, to paraphrase Firth, if a graphical symbol is to be an effective instrument of visual communication, it is essential that it should convey much the same thing to users, and the range of variation in user interpretations should not inhibit the action desired, *nor should the symbol design, in and of itself, inhibit communication by its failure to constrain extraneous interpretations.*

The notion of constraining extraneous interpretations through symbol design was based on the assumption that 'the range of variation [of user] interpretations' (op.

cit.) was a factor of both the users and the symbol design. Thus, communication of the 'action desired' (op. cit.) would be clearly enhanced if the design of the symbol would, in a material sense, constrain user interpretations. In this regard, the research focused on the graphical forms of symbols and how they related to symbol referents, i.e., the 'idea or object that the graphical symbol is intended to represent' (International Organisation for Standardisation, 2001: part 3.8) and consequently, the arbitrary (or non-arbitrary) nature of the signifier-signified (symbol-referent) relationship. This implied differing pictorial-to-abstract symbol semiosis (i.e., the respective processes by which graphical symbols signify meaning), an aspect explored through the semiotic theories of iconicity, indexicality, and symbolicity.

1.2.3 Suitability measures and alternative symbol proposals

With a view to determining the most suitable symbol for the movement, we evaluated current emblems and new designs. Suitability was based on a demonstrable ability to denote the movement's key attributes (see Section 3.3); symbol comprehensibility and meaning in relation to these attributes; frequency of negative and parochial connotations (e.g., religious, ethnic, or political); and a set of criteria proposed by the International Committee of the Red Cross (Bugnion, 2000: 32-33). The criteria are reproduced below.

1 Any solution must be assessed primarily in the light of the protection afforded to victims and must actually lead to an improvement in such protection.

2 Any solution must be based on the existence of the two emblems currently in use, that is, the cross and the crescent, which are de facto placed on an equal footing and which are known worldwide.

3 Any solution must avoid creating new obstacles for the Movement's ideal of unity and must, on the contrary, be compatible with that ideal.

4 Even though this ideal of unity naturally extends to the emblem, the objective of having a single emblem for both protective and indicative purposes is not on the agenda at present; the aim is to solve the difficulties faced by States and National Societies that are unable to use either the red cross or the red crescent.

5 Any solution must be capable of settling these problems without creating new ones for National Societies which have no difficulties in this respect, and which must be able to carry on with their present emblems (status quo).

6 The issue of the emblem must not cause division within the Movement; any solution must be very widely acceptable and any resolution on this crucial matter must be adopted by consensus.

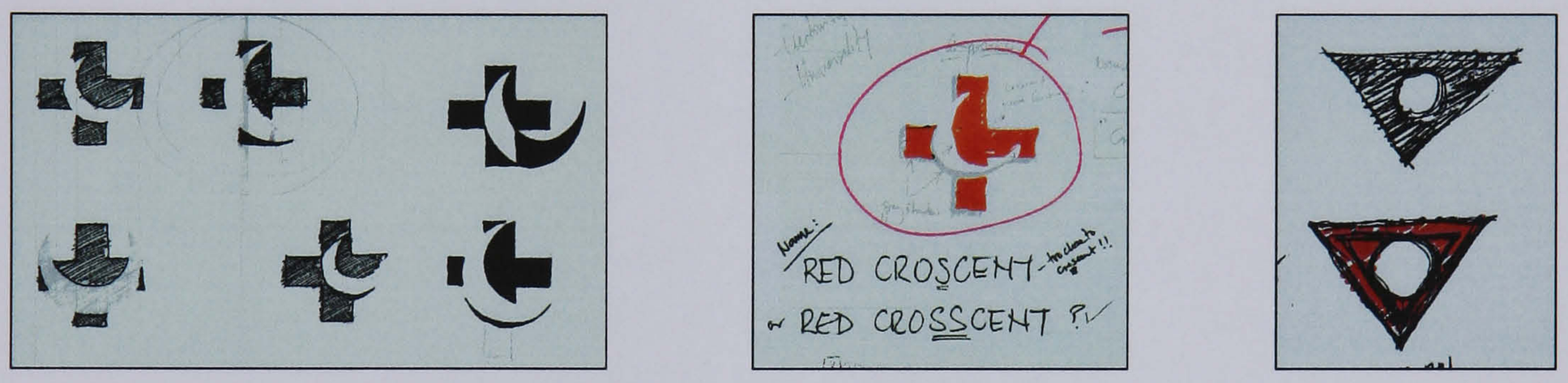

Figure 1.2: Author's sketches and suggested name for the Crosscent (left and centre), and visualisation of the Heart proposal (right).

Two symbols were included in the test material additional to the four in Figure 1.1 (Figure 1.2). The composite Crosscent, designed by the author, was introduced to test the notion of constraining symbol interpretation and/or re-orienting symbol meaning by simply combining the Cross and Crescent emblems. The Heart was based on a proposal put forward by the Netherlands at a Diplomatic Conference held in Geneva in 1949. This was one of several meetings which have over the years attempted to resolve the symbol issue (see Bugnion, 1977). The Netherlands

delegate 'suggested that the sign might be a stylized red heart in the form of an inverted equilateral triangle' (op. cit.: 40).

1.2.4 Utility of ISO 9186: 2001 outside its previous domain of use

Symbol comprehensibility, meaning, and negative connotations were determined using ISO 9186: 2001. The procedures (see International Organisation for Standardisation, 2001) were 'initially designed to apply to public information and safety signs' (Foster, 2001: 13). The emblems of the movement do not fall within the domain of public information or safety symbology. This suggests this study assessed for the first time the utility of ISO 9186: 2001 outside its previous domain of use. What follows is the main body of this research.

2 Literature review

2.1 From the verbal to the visual mode of communication

Human communication has developed from an almost entirely verbal form (spoken and written) to an increasingly visual one. That the verbal modes of communication still remain relevant and popular is not in doubt. However, the visual mode seems to have pervaded so many areas of human intercourse that it now appears, quantitatively at least, to be a dominant mode of communication. 'One possible explanation may be [that the] reliance on the medium of writing for communication and representation … has produced the present situation of information overload …' (Kress, 1998: 55). Additionally, different alphabets and languages limit the wider use of the written and the spoken forms of communication, hence the development towards the visual medium (Kolers, 1969: 348-350), a mode of communication that has been described as 'language independent' (Zwaga, 1989: 979).

This thesis acknowledges, but does not concern itself with, the historical and technological developments that have brought about these changes in human communication. Indeed, the subject of the investigation – visual communication as it relates to graphical symbol form – would not be relevant if these changes had not taken place. Rather, the arguments raised here revolve around the semiosis and comparative effectiveness of symbols of differing graphical form in the context of 'public graphics'.[3]

An assessment of visual material evaluated in studies involving public graphics points to an over abundance of pictorial (as opposed to abstract) test material, in particular pictorial graphical symbols. It is argued here that this apparent preference for, or bias towards, pictorial symbols is not based on an adequate

[3] The term is borrowed from the 'Public Graphics: visual information for everyday use' conference title (see: Zwaga, Boersema, & Hoonhout, 1994).

understanding of the graphical characteristics, semiosis, and relative effectiveness of various conventions, for example, schematic and abstract graphical symbols. This assertion is made on the basis of the lack of sufficient evidence to indicate that pictorial symbols are comparatively better at representing and communicating information visually than schematic or abstract alternatives.

2.2 Relationship between symbols and referents

It is argued further that the nature of the 'interrelations' between the verbal and the visual modes of communication (Kress, 1998: 73) have not been critically examined in graphical symbols research. As will be demonstrated here (as it has been elsewhere, particularly in the domain of public information symbol research), the successful coupling of a graphical symbol to its referent is a key determinant if not predictor of successful visual communication. Firth (1973) wrote:

> What the process of symbolic representation presumably does is to abstract some quality common to both referent and symbol and allow one to perceive more clearly, more imaginatively, a particular type of relationship, uncluttered by details of the referent... (p. 82-83).

Thus, an examination of the relationship between symbols and referents presented a viable basis for understanding better the notion of "visualisation" of information, and hence how meaning was represented and communicated by means of graphical symbols. With this in mind, we turned to semiotics. As Maldonado (1989) had observed: 'All the disciplines which examine communication through the medium of signs and sign-signals will necessarily lead to semiotic[s]' (p. 213).

2.3 Semiotics and visual communication

'Semiotics occurs whenever we stand back from our ways of understanding and communicating, and ask how these ways of understanding and communicating arise, what form they take, and why' (Sless, 1986: 179). Visual communication, on the other hand, is concerned with (but not limited to) the use of the visual

representation of information – to communicate instructions, processes, ideas, directions, warnings, etc. In other words, to communicate information encapsulated in visual form.

These approaches to semiotics and visual communication suggest the inextricable link between the two areas of knowledge (Moriarty, 1994: 2).[4] On the one hand, in semiotics we have a corpus of work which examines the *processes* of communication by way of determining, at least theoretically, how and why symbols convey meaning. On the other hand, in visual communication we have a professional and academic area which develops and puts into use the media of visual communication, i.e., the *products,* in the form of icons, signs, graphical symbols, illustrations, pictorial sequences and other interfaces by which information is represented and communicated visually. This interrelatedness between semiotic processes and visual communication media is underlined by the observation: 'Much of what is said of semiotics suggests that it belongs with those theories that help us to understand the products of design' (Kinross, 1986: 191). Thus, meaning, signification, communication, and understanding come into play when semiotics and visual communication come together.

2.3.1 Dyadic and triadic sign relations

Contemporary semiotics derives broadly from two founding fathers, Ferdinand de Saussure (1857-1913) and Charles Sanders Peirce (1839-1914) (Cobley & Jansz, 1997; Sless, 1986). Saussure postulated that a sign was made up of the 'signifier/ material aspect' and 'signified/mental concept' dyad (see Cobley & Jansz, 1997: 10-14). Moriarty (1994) wrote:

> Because of his background as a linguist, Saussure saw the relationship between [signifier and signified] as arbitrary … the link between the sign, or

[4] Page references to web-accessed documents correspond to the pagination of A4 Microsoft Word printouts of the documents.

> expression, and what it stands for is understood by convention. This arbitrariness is true in most spoken and written language ... however, that may not be so for other types of signs such as visuals that provide stylized cues to stimulate recognition through resemblance (p. 1).

Peirce, on his part, developed a version of semiotics[5] which revolved around a three-way relationship between, among other things, the sign (representamen), its object (the thing represented), and the result of the signification process (the interpretant) (Cobley & Jansz, 1997: 19-35). The representamen was analogous to Saussure's 'signifier/material aspect' half of the dyad, while the interpretant was analogous to the 'signified/mental concept' half. The definition of an 'object' in the sign relation appears to be the key difference between Saussure's dyadic and Peirce's triadic sign relations. 'Peirce ... a cognitive philosopher ... define[d] signs in a broader way than language [and by implication, Saussure] and focuse[d] on how [signs were] logically or semiotically linked to their objects' (Moriarty, 1994: 1).

Further, Peirce postulated that these *links to objects* were either iconic, indexical, or symbolic (Hoopes, 1991: 239). This implied that the process of signification, i.e., the relationship between the representamen (Saussure's 'signifier/material aspect') and the interpretant (Saussure's 'signified/mental concept') was iconic, indexical, and/or symbolic. Moriarty (1995) described these iconic, indexical, and symbolic signification processes as 'patterns of meaning construction' (p. 14).

2.3.2 Hypothetical propositions

With regard to the current investigation, Saussure's 'signifier/material aspect' and 'signified/mental concept' dyad allows one to theorise the visual and semantic relationship between a symbol and its referent. Thus, we hypothesised that the successful visualisation of information would entail a graphical symbol's 'material

[5] The terms "semiology" and "semiotics" were associated with the European and American schools of sign studies, respectively. Semiotics has become the more general term (Cobley & Jansz, 1997: 13).

aspect' (i.e., the 'signifier' half of the dyad, or symbol design) being informed in a creative design sense by the referent meaning. Successful communication of this visualised information would therefore entail the symbol engendering in users a 'mental concept' or reading (i.e., the 'signified' half of the dyad) approximate to the referent (i.e., what the symbol stands for).

Conceptualised in this manner, the symbol design would presumably be *visually resonant* with the referent meaning. The referent, in turn, would presumably be *semantically resonant* with the symbol design, producing a visual-verbal coupling analogous to Saussure's 'signifier-signified' dyad. The symbol-referent relationship would therefore not be arbitrary; rather, it would be visually *and* semantically motivated.

Peirce's triadic sign relations, on the other hand, enables one to postulate that the graphical forms of symbols represent iconic, indexical, and/or symbolic 'patterns of meaning construction' as Moriarty (1995: 14) appears to have done. At face value, this formulation appears congruent with the respective pictorial-to-abstract characteristics of graphical symbols. Thus, we hypothesised that a symbol's meaning would be more readily apprehended and interpreted through the corresponding iconic-to-symbolic semiotic and pictorial-to-abstract material manifestations of graphical symbols.

This would entail symbol iconicity, indexicality, and symbolicity being a function of the respective pictorial, schematic, and abstract graphical forms of symbols. Additionally, it presumes symbol iconicity, indexicality, and symbolicity is a stable construct at different levels of symbol use, e.g., at the referent denotation and symbol interpretation levels of visual communication.

2.3.3 Symbol semiosis: pre-research

In a study aimed at, among other things, improving instructional text design (e.g., school textbooks), Sadoski et al. (1993) experimented with concrete and abstract language. The authors gave 'slender ballerina' and 'valid hypothesis', respectively, as examples of such language and defined concreteness as 'ease of imagery' (p. 291). Their results demonstrated the cognitive effect of embedding concrete language in text – improved understanding and memorability of the text, an outcome which supported dual coding theory (p. 301). They suggested concrete language embeds imagery engendered by the textual material in reader's minds more efficiently than abstract language. Theoretically then, concrete referents would be resonant with pictorial (iconic) symbols, if only because this class of symbols encapsulates the notion of 'ease of imagery'. The same should hold true of abstract referents and abstract (symbolic) symbols, notwithstanding the logically converse "difficulty of imagery" of abstract language.

Iconicity *[Visual analogue]*	**Indexicality** *[Observable consequence]*	**Symbolicity** *[Convention/agreement]*
[The symbol] resembles what it stands for	[The symbol] is meant to point at something definite	[The symbol] has been arbitrarily set for what it stands for
[The symbol] represents something real as an image	[The symbol] is meant to indicate a direction	[The symbol] has its meaning by virtue of convention
[The symbol] and what it stands for have many characteristics in common	[The symbol] is meant to serve as orientation	[The symbol] is understandable only if one has learned its meaning beforehand

Table 2.1: Semiotic dimensions, characteristics, and evaluation criteria (adapted from Krampen, 1983).

Krampen (1983) lends credence to this proposition; he developed, over a series of empirical investigations, several criteria for classifying iconic, indexical, and symbolic signs (Table 2.1). Specifically, the criteria for iconicity and symbolicity appear consistent with the hypothesised congruence between the respective iconic-to-symbolic semiotic and pictorial-to-abstract material manifestations of graphical symbols.

However, Moriarty (1994) observed that: 'Symbols are arbitrary, but icons and indexes are ... "motivated", that is they are more likely to resemble their object in some way, rather than being arbitrary' (p. 1). Thus, Moriarty extends our iconic-pictorial expectation to indexical signs, a clarification which appears to resolve Smith's (1986: 201) doubts about the existence of indexical graphic images, the origin of the uncertainty being Peirce's triadic sign theories and the aspect of causality with respect to indexical signs (see Cobley & Jansz, 1997; Hoopes, 1991).

If we accept Moriarty's (1994) view in the interim, we are still left with the question, are these delineations discernible in graphic symbology? This study attempted to answer this question from the perspective of public graphics.

2.4 Graphical modes for information representation and communication

The context within which graphical symbols are considered in this thesis is as agencies for representing information visually, and as visible artefacts for communicating the embedded information. Graphical form is defined as the global design characteristics which these visual representations of information may take, characteristics which may lie along a 'figurative' to 'non-figurative' continuum (Richards, 2000: 97). A 'figurative' visual representation of an object, for instance, would be truer, in a visual sense, to the original object than a 'non-figurative' visual representation. The movement from the 'figurative' via the 'semi-figurative' to the 'non-figurative' end of the representational continuum (op. cit.) is in some respects comparable to the teaching of cubism on some art and design courses and would be considered a form of abstraction.[6] From a still-life or life model, the artist/designer "reduces" the realistic drawing to a more mannered, structured, and stylised finished artwork in a sequence of abstractive steps (cf. Dondis, 1973: 71-81).

[6] This format of teaching cubism is based solely on the author's recollection of an undergraduate class at the University of Nairobi, Kenya (1984-1987).

Thus, we would expect abstract visual representations to share less visual (iconic) qualities with their referents than pictorial visual representations. This abstraction process is mirrored in the characterisation of visual representations one encounters with some frequency in the literature (Table 2.2) and provided the means by which we classified the test material (see Section 3.4).

Source	Characterisation of visual representations		
Arnheim (1970: 151)	Replica	Stylised	Non-mimetic
Blackwell and Engelhardt (2002: 4)	Realistic	Schematic	Abstract
Dondis (1973: 67)	Representational	Abstract/Kinesthetic	Symbolic/Arbitrary
Eliot (1960: 50, 53)	Pictorial	-	Abstract
Familant and Detweiler (1993: 711)	Iconic	-	Symbolic
Frutiger (1989: 348-349)	Naturalistic	Schematised	Abstract
Hakiel and Easterby (1984: 424)	Pictographic	-	Symbolic
Kazmierczak (2000/2001: 176)	Imitational	-	Diagrammatic
Krampen (1965: 12)	Pictograph	-	Diagram
Modley (1966: 115)	Image-related	Concept-related	Arbitrary
Moriarty (1985: 3)	Literal	-	Symbolic
Richards (2000: 97)	Figurative	Semi-figurative	Non-figurative
Classification of test symbols	 *Pictorial*	 *Schematic*	 *Abstract*

Table 2.2: Classification of the test material employing categories proposed by previous authors. The symbols were (from left) Lion and Sun, Cross, Crescent, Crosscent, Heart, and Crystal.

One obvious reaction to the descriptions in Table 2.2 is the need for a standardised terminology to identify the positions along the continuum of abstraction, even as one concedes that a generalised terminology may not suit every domain within which visual representations are discussed, for example, anatomy, anthropology, mass media, statistics, etc. This thesis, grounded as it is in information design/

visual communication, adopts the terms "pictorial", "schematic", and "abstract" to describe the three categories of visual representation.

2.5 Graphical symbols research

There is little evidence of studies which evaluate comparatively the effectiveness of pictorial, schematic, and abstract graphical symbols. This is not altogether surprising. Symbol research is often less concerned with the relative merits of pictorial, schematic, and abstract graphical symbols *per se*. The focus appears to be evaluating specific symbol sets to determine individual symbol effectiveness, regardless of the differing graphical forms of the variants within the symbol set.

Broadly speaking, effectiveness measures relate the symbol to its referent, its potential users, and the context of use. Common aspects evaluated include: appropriateness (e.g. Brugger, 1990, 1994; Foster, 1990; Zwaga & Easterby, 1984); communicativeness (e.g., Green & Pew, 1978); comprehension/recognition (e.g. Brugger, 1990, 1994; Olgyay, 2000/2001; Olmstead, 1994; Young & Wogalter, 2000/2001; Zwaga, 1989; Zwaga & Easterby, 1984); the effect of context (e.g., Cahill, 1975; Wolff & Wogalter, 1998); function identification (e.g. Barker & van Schaik, 2000; Green & Pew, 1978); perceptual discriminability (e.g. Geiselman, Landee, & Christen, 1982); and strength of association (e.g. Moses, Maisano, & Bersh, 1984).

With the exception of the latter two studies which deal exclusively with abstract and schematic (as defined in Table 2.2) military symbols, the rest of the studies above have evaluated, in the main, pictorial graphical symbols. In Zwaga and Easterby (1984), the authors noted that the high incidence of 'don't know' responses to two variants for the referent "information" – the letter "i" and question mark "?" – was an indication of 'the level of abstractness of these symbols' (p. 285). Alphanumeric

marks are indeed considered an abstract media for object representation (Wileman, 1993: 12). However, they constitute a communication mode distinct from the visual alternative (Kress, 1998). Hence Zwaga and Easterby (1984) would not be considered a comparative pictorial vs. abstract graphical symbols study.

2.6 Need for research

A rare account of research which assessed the comparative effectiveness of pictorial and abstract visual representations was given by Moriarty (1985). The study looked at 'the visual contributions to communication effectiveness … between symbolic and literal visuals and their impact on cognitive and affective audience responses' (p.3) in the context of mass communication.

Moriarty (1985) exposed three versions of the same magazine article to a group of college students in the United States. The text was presented in three forms. In the first, the article was accompanied by a realistic illustration (the 'literal' visual). In the second, a stylised illustration (the 'symbolic' visual) substituted the realistic illustration. The third version had no illustration. The objective was to rate how the juxtaposition of a 'literal' or 'symbolic' visual with accompanying text, or the absence of a visual altogether, would contribute to the understanding of the article.

The results proved inconclusive, the author acknowledging shortcomings in the research design and measures used (p.9). However, an examination of the descriptions given of the visual material suggests that this "inconclusive" outcome may have had something to do with the visuals themselves. (The materials used in the study are not illustrated in the article referred to; Moriarty acknowledged to this author after an email enquiry that these were not available, and that she had not undertaken further work in this area.)

Moriarty (1985) described 'symbolic' visuals, presumably belonging in the extreme right column of Table 2.2, as 'more figurative and connotative' (p.3). If we take Richards' (2000: 97) definitions as markers (see Table 2.2), this would seem to place the 'symbolic' visual used in the study closer to the pictorial end of the continuum (column 2 in Table 2.2). This would, in turn, suggest that the 'symbolic' visual was closer in visual terms to the 'literal' visual (belonging most likely in column 2), as opposed to being entirely abstract (i.e., belonging in column 4). Unsurprisingly, the author concluded that the test results 'did not separate the different effects of literal and symbolic visuals' (Moriarty, 1985: 9). That notwithstanding, the expectation that 'realistic/literal' and 'stylised/symbolic' illustrations would contribute to the understanding (or otherwise) of the article presupposed a differential in respective contributions to 'communicative effectiveness' by the two illustrative modes.

With specific reference to graphical symbols research, there are apparently no other published accounts of this kind of enquiry, i.e., tests which submit to methodical and empirical analysis, pictorial, schematic, and abstract symbols intended to communicate the same message. It is difficult to understand why this aspect of visual communication has been ignored, the more so when one considers the frequent and ongoing activity of theoretical and descriptive characterisation of the different modes of visual representations, evidenced by the forty-year span of the references (1960 to 2000) in Table 2.2.

2.7 Summary

The literature review and research objectives may be summarised as follows:

1. It has been acknowledged that human communication has developed from an almost entirely verbal mode to an increasingly visual one.

2. It has been argued that integrating semiotic theory with visual communication practice gives a better purchase on the notions of meaning, signification, communication, and understanding through the media of graphical symbols.
3. The schematic and abstract modes of visual representation described variously in columns 3 and 4 in Table 2.2 suggest that the repertoire available for the visual representation and communication of information is not restricted to the pictorial mode.
4. Moriarty's (1985) experiment presupposed a differential in the respective contributions to communicative effectiveness of literal and symbolic visuals. A similar expectation can be extended to pictorial, schematic, and abstract graphical symbols.
5. Sadoski et al's (1993) notion of 'ease of imagery' is predicted to result in statistically significant associations ($p<0.05$) being made between pictorial symbols and concrete referents, and between abstract symbols and abstract referents, demonstrating that the symbol-referent relationship is visually and semantically motivated and hence non-arbitrary (see H1 in Table 2.4).
6. If the semiosis of graphical symbols (i.e., the process by which graphical symbols signify meaning) is a function of their respective graphical forms, then the semiosis of pictorial, schematic, and abstract symbols would be respectively and consistently iconic, indexical, and symbolic at different levels of visual communication (see Table 2.3, and H2 and H3 in Table 2.4).

Graphical form	*Pictorial*	*Schematic*	*Abstract*
Test symbols			
Predicted semiosis	*Iconic*	*Indexical*	*Symbolic*

Table 2.3: Predicted symbol semiosis.

Research objectives	Hypothetical propositions
• To examine the comparative effectiveness of pictorial, schematic, and abstract graphical symbols. • To test the notion of constraining and/or re-orienting symbol interpretation through symbol design. • To evaluate the suitability of current and proposed symbols to represent visually key attributes of the movement. • To gauge the utility of ISO 9186: 2001 in a new context.	H 1. The signifier-signified/symbol-referent relationship is not arbitrary; rather, it is visually *and* semantically motivated. H 2. Symbol iconicity, indexicality, and symbolicity are a function of the respective pictorial, schematic, and abstract graphical symbol forms. H 3. Therefore, symbol iconicity, indexicality, and symbolicity would be a stable construct at the referent denotation and symbol interpretation levels of visual communication.

Table 2.4: Summary of research objectives and hypothetical propositions.

3 Methodology

3.1 Overview

A basic assumption behind the use of graphical symbols is that the visuals stand, 'in some respect or capacity' (Cobley & Jansz, 1997: 22), for the concepts, messages, entities, or processes they represent. Thus, the test symbols were assumed to stand for the International Red Cross and Red Crescent Movement. However, the movement describes itself as a proponent of certain ideals and practices (see Section 3.3 below). We argued therefore that a key requirement for a symbol representing the movement would be that the symbol *ought* to be viewed as encapsulating visually these idealistic and practical attributes. (The terms "attribute" and "referent" are thus applied interchangeably in this thesis.) The correspondence rating studies adopted to this end were adapted from Young and Wogalter (2000/2001).

Correspondence rating (studies 1 and 2) is akin to an appropriateness test because in both tests, participants rate how visually appropriate a symbol is to what it is meant to stand for. In our case these were the movement's key attributes. In many ways, correspondence rating is similar to the appropriateness component of the initial versions of ISO 9186 (see Brugger, 1994; Foster, 1994; Zwaga & Easterby, 1984). Thus, by evaluating the correspondence/appropriateness between symbols and referents, we would establish, (a) whether there was a visual and semantic link between the pictorial-to-abstract graphical characteristics of the test symbols (Table 2.2) and Sadoski et al's concrete-to-abstract language proposition (see Section 3.3); and consequently, (b) whether this link was arbitrary as conceptualised by Saussure or visually motivated as anticipated by Moriarty.

Studies 3 to 5 were based on the current version of ISO 9186 (International Organisation for Standardisation, 2001). These are respectively: comprehensibility

judgement test (study 3) and comprehension test (studies 4 and 5). The comprehensibility judgement test is described as a 'procedure for eliciting judgements of the comprehensibility of [the] proposed graphical symbols' (part 3.2). The procedure is also known as comprehensibility estimation (Brugger, 1994; Zwaga, 1989). In practice, it is a rating made by a respondent (on behalf of the population that the respondent belongs to) of the relative understandability of a set of symbol variants, given one referent meaning.

Ratings of symbol-attribute correspondence from studies 1 and 2 were employed as predictors of the attribute(s) which each symbol was expected to be most comprehensible (as a visual representation of) in study 3. In other words, if a particular symbol was rated an appropriate visual representation of a particular attribute, it was expected that the symbol would be judged most comprehensible if it was proposed as a visual representation of the same attribute. In this manner we could examine, (a) whether the empirically established symbol-attribute correspondences translated into meaningful, visually representative, and communicative artefacts; (b) whether the symbol-attribute relationship was arbitrary; (c) whether the symbols were suitable visual representations of the movement's attributes; and, (d) whether pictorial, schematic, or abstract graphical symbols were comparatively better at representing and communicating information visually.

The comprehension test (studies 4 and 5) is described as a 'procedure for quantifying the degree of understanding of [the] proposed graphical symbols' (part 3.3). It has been treated also as a test for symbol recognition (Brugger, 1990: 81; 1994: 26.2; Dewar & Ells, 1984: 79; Zwaga & Easterby, 1984: 282). Because the procedure indicates the extent to which a symbol is understood with respect to what it is meant to stand for, comprehension testing is considered one of the most

important symbol evaluation measures (Brugger, 1994: 26.6). Responses to the question 'What do you think this symbol means?' are 'quantified' by way of response classification (similar, unique, and 'don't know' responses, etc.) and frequency counts of these. Zwaga and Easterby (1984) state: 'Strictly speaking there is no absolute right and wrong response; a response can only be evaluated in terms of the intended meaning of the referent/symbol being [tested] ...' (p. 283). In practice therefore, the data collected are *qualitative*. As such, the test uncovers symbol denotations and connotations, a useful undertaking unique to this particular open-ended test.

It is this characteristic of the comprehension test which allowed for, (a) the classification of participant responses as iconic, indexical, and/or symbolic symbol interpretations utilising, and hence providing a means to validate, Krampen's iconicity, indexicality, and symbolicity criteria (see Table 2.1). Additionally, the procedure provided a means with which to, (b) validate Peirce's triadic sign theories in relation to graphical symbol form; (c) determine the congruence between the iconic-to-symbolic semiotic and pictorial-to-abstract material manifestations of graphical symbols as postulated in Sections 2.3.2 and 2.3.3; and, (d) examine the comparative effectiveness of pictorial, schematic, and abstract graphical symbols to represent and communicate information visually.

3.2 Choice of test methods

One presupposes that, in the development of ISO 9186, a consideration was made of the gamut of symbol effectiveness measures cited in Section 2.5. Accounts of the initial ISO 9186 development phase (Easterby & Graydon, 1981a, 1981b; Easterby & Zwaga, 1976) and later reviews (Brugger, 1990, 1994; Foster, 1990, 1994, 2001; Simlinger, 1980; Zwaga, 1989; Zwaga & Easterby, 1984) suggest this to be the case. Specifically, the account by Brugger (1994), which makes comparisons

between various procedures *within* the ISO 9186 development paradigm, and Foster (1994), which takes a far *broader* sweep of the graphical symbol evaluation landscape (covering in a general sense the former), suggest this assumption is not misplaced. Thus, the emphasis placed in this investigation was not so much on assessing specific symbol evaluation techniques or methods *per se*. This occurs naturally in the course of any investigation. Rather, we sought to examine in a number of ways (visual-verbal correspondence, comprehensibility, and meaning) symbols of differing graphical forms in order to understand better the processes of information visualisation, graphical signification, and symbol semiosis.

3.3 Identification of the movement's key attributes and symbol referents

In the ICRC's strategic plan and in its statutes (International Committee of the Red Cross, 1997, 1998), one encounters several key words revolving around four identifiable themes. These four themes appear to capture the movement's actions and ideals:

1. **Humanitarianism** (key words: guardian, promoter, and disseminator of International Humanitarian Law; humanitarian action, activities, assistance, diplomacy, mission, and platform; humanity; voluntary service).
2. **Protection** (key words: establishment of rules; forestall suffering; protect; strengthen).
3. **Neutrality** (key words: impartiality; independence; intermediary; neutral; non-coercive).
4. **Universality** (key words: international movement; unity; universality).

These themes represent what the movement does, how it does it, and ultimately, how it would like to be perceived, i.e., as humanitarian, protective, neutral, and universal, and could be considered its key attributes. It is therefore no coincidence

that these attributes resemble closely the movement's Fundamental Principles of humanity, impartiality, neutrality, independence, voluntary service, unity, and universality (see International Committee of the Red Cross, 1996). The use of the movement's emblems is operationalised under the Geneva Conventions of 1949 and Additional Protocols of 1977. The principal mission of the movement, that of protection and assistance (International Committee of the Red Cross, 1997) is informed and primarily driven by the protective and humanitarian attributes respectively. The Convention and Additional Protocols which are at the origin of the movement's legitimacy deal almost exclusively with the protection of victims of armed conflict. This undertaking is recognised under international humanitarian law. The movement enhances its legitimacy and access to victims through its neutrality. It attends to human suffering on a global scale either practically or through its diplomacy; this is its claim to universality.

Taking the everyday meaning of the respective attributes and the Fundamental Principles of the movement into consideration, the humanitarianism attribute translates to: offering assistance voluntarily and without discrimination; the protection attribute to: sheltering the vulnerable from attack, ill treatment, or ill health; the neutrality attribute to: being impartial or unbiased; and the universality attribute to: reflecting a wider concern and global response to human suffering. These descriptions were used on the respective comprehensibility judgement test questionnaires to aid respondents understand the meaning of each attribute.

Following Sadoski et al. (1993), the attributes humanitarianism and protection would appear to be relatively concrete – it is "easier to imagine" what these two activities, as described above, would "look" like. Conversely, neutrality and universality would appear to be relatively abstract concepts in comparison to humanitarianism and protection when one considers the descriptions above.

3.4 Classification of the test material

Tabulating into three columns the various descriptions of visual representations by previous authors (Table 2.2) facilitated the placement of the six test symbols into each category according to graphical 'modes of depiction' (Richards, 2000: 97). This offered a method for delineating the test material into distinct graphical forms, overcoming the shortcomings of Moriarty (1985) discussed in Section 2.6.

3.5 Conduct of the tests

3.5.1 Studies 1 and 2

Two correspondence rating studies were carried out, in Kenya (August 2002) and in the UK (October 2002). The 56 participants in Kenya (study 1) were recruited from randomly selected households in five urban and suburban areas across the country. These areas were chosen to reflect the country's different ethnic and religious regions, namely – from west to east – Kisumu (predominantly Luo and Christian), Nakuru (Kikuyu and Kalenjin, and Christian), Nairobi (multi-ethnic capital city, Christian and Muslim), Nyeri (Kikuyu and Christian), and Mombasa (Swahili and Mijikenda, and Muslim). Randomisation was achieved by adopting a technique applied frequently in market research. The first person in the first house, and subsequently every fifth house or homestead on the left side of the street or road who was at least 15 years old and who was able to read and understand English, was invited to participate in the study. In the event that this individual declined, another member of the same household who met the age and language criteria would be approached, failing which the process would be repeated in the fifth house or homestead from this point. The minimum age of respondents as prescribed in ISO 9186: 2001 is 15 years. Even though only studies 3 to 5 were based on ISO 9186, the same criterion was maintained in studies 1 and 2 in order to make comparable the results of the five studies. The questionnaires were in English, hence the requirement that participants could read and understand the language.

The 54 participants in the UK (study 2) comprised a multi-cultural design student cohort attending the 2002/03 M.A./M.Sc. Design and Manufacture programme at De Montfort University, Leicester. Thus, randomisation in this case was to the extent to which the students belonged to different nationalities and religions. Tables 3.1 and 3.2 indicate the characteristics of participants in studies 1 and 2.

		Frequency	Percent
Age	15-30	28	50.0
	31-50	21	37.5
	51+	7	12.5
	Total	**56**	**100.0**
Gender	Male	36	64.3
	Female	20	35.7
Education	Secondary	23	41.1
	Technical/College	23	41.1
	University	10	17.9
Ethnicity	Black African	51	91.1
	Indian	3	5.4
	Arabic	1	1.8
	White	1	1.8
Religious group	Muslim	9	16.1
	Christian	44	78.6
	Hindu	2	3.6
	None	1	1.8

Table 3.1: Characteristics of participants in study 1 (Kenya).

		Frequency	Percent
Age	15-30	47	87.0
	31-50	7	13.0
	Total	**54**	**100.0**
Gender	Male	24	44.4
	Female	30	55.6
Education	University	54	100.0
Ethnicity	Black African	2	3.7
	Indian	2	3.7
	Arabic	1	1.9
	Asian	3	5.6
	White	12	22.0
	Taiwanese	16	29.6
	Korean	1	1.9
	Chinese	11	20.4
	Bangladeshi	3	5.6
	Thai	1	1.9
	Pakistani	2	3.7
Religious group	Muslim	5	9.3
	Christian	10	18.5
	Hindu	3	5.6
	Buddhist	5	9.3
	Other	1	1.9
	None	15	27.8
	Not indicated	15	27.8

Table 3.2: Characteristics of participants in study 2 (UK).

The six symbols were placed in a circle on one side of an A4 single-sheet questionnaire (Appendix I and II). The four attributes (humanitarianism, protection, neutrality, and universality, numbered 1 to 4 respectively) were proposed as the alternative "ideas" or "objects" which the symbols represented. The numbered attributes substituted for the numeric rating (0 to 100) scale used by Young and Wogalter (2000/2001: 129). On the front of the questionnaire, the Amnesty International logo was presented as an example. Space for filling in demographic details was also provided here. The test symbols were on the reverse. Respondents rated symbol-attribute correspondence by encircling the equivalent number(s) above each symbol. Multiple answers were admissible for each symbol – the Amnesty International example demonstrated this. Lack of correspondence was indicated by not marking any number (study 1) or by encircling a fifth option, "none of these" (study 2).

3.5.2 Study 3

The comprehensibility judgement test was carried out in Kenya between May and July, 2002. A different set of participants were recruited from randomly selected households in the five urban and suburban areas detailed in Section 3.5.1. The same randomisation technique was applied. Participant recruitment for study 3 began at the point of termination of recruitment for study 1; hence there was little likelihood of any respondent taking part in both studies.

An A4 single-sheet questionnaire bearing the six symbols placed in a circle and one of the four attributes was presented to each participant. Hence separate samples evaluated each attribute against the six symbols (see Appendix III, IV, V and VI). Participants were required to read the instructions on the front of the questionnaire which included an interpretation of the meaning of the attribute, the function of the symbol, and locations where the symbol would normally be encountered. Space for

filling in demographic details was provided here. On the reverse, participants were requested to write down the percentage of the population which they expected would understand the meaning of each symbol if it represented visually the attribute, writing in the space provided next to each symbol, 0% if they thought no-one would understand, 100% if they thought everyone would understand, with any estimates in-between. The ISO target of at least 50 respondents per referent was exceeded; a total of 233 questionnaires were completed comprising 57 humanitarianism, 60 protection, 57 neutrality, and 59 universality responses. Table 3.3 indicates the characteristics of participants in study 3.

		Frequency	Percent
Age	15-30	110	47.2
	31-50	76	32.6
	51+	47	20.2
	Total	**233**	**100.0**
Gender	Male	132	56.7
	Female	101	43.3
Education	Primary	3	1.3
	Secondary	93	39.9
	Technical/College	65	27.9
	University	72	30.9
Ethnicity	Black African	222	95.3
	Indian	5	2.1
	Arabic	2	0.9
	White	2	0.9
	Asian	1	0.4
	Black American	1	0.4
Religious group	Muslim	46	19.7
	Christian	180	77.3
	Hindu	3	1.3
	Other	1	0.4
	None	3	1.3

Table 3.3: Characteristics of participants in study 3 (Kenya).

3.5.3 Studies 4 and 5

Two comprehension tests were carried out, in Kenya (June 2002) and in the UK (October 2003). The 20 participants in Kenya (study 4) were members of staff of a market research agency in Nairobi, while the 33 participants in the UK (study 5) comprised a multi-cultural design student cohort attending the 2003/04 M.A./M.Sc. Design and Manufacture programme at De Montfort University, Leicester.

Participants were requested to examine each of the six symbols on the front and back of the A4 single-sheet questionnaire and write down what they thought it meant, or 'don't know' if they could not assign a meaning to the symbol. The Amnesty International logo was used as an example on the front of the questionnaire (see Appendix VII and VIII). Space for filling in demographic details was provided on the reverse. Multiple answers were admissible for each symbol as the Amnesty International example demonstrated. Characteristics of participants in studies 4 and 5 are set out in Tables 3.4 and 3.5.

		Frequency	Percent
Age	15-30	14	70.0
	31-50	4	20.0
	51+	2	10.0
	Total	**20**	**100.0**
Gender	Male	13	65.0
	Female	7	35.0
Education	Secondary	4	20.0
	Technical/College	7	35.0
	University	9	45.0
Ethnicity	Black African	20	100.0
Religious group	Christian	19	95.0
	Not indicated	1	5.0

Table 3.4: Characteristics of participants in study 4 (Kenya).

		Frequency	Percent
Age	15-30	29	87.9
	31-50	4	12.1
	Total	**33**	**100.0**
Gender	Male	14	42.4
	Female	19	57.6
Education	University	33	100.0
Ethnicity	Black African	1	3.0
	Black Caribbean	1	3.0
	Indian	3	9.1
	Arabic	1	3.0
	Asian	1	3.0
	White	6	18.2
	Taiwanese	7	21.2
	Korean	1	3.0
	Chinese	7	21.2
	Latina	3	9.1
	Greek	1	3.0
	Not indicated	1	3.0
Religious group	Muslim	2	6.1
	Christian	7	21.2
	Hindu	2	6.1
	Buddhist	3	9.1
	Other	3	9.1
	None	7	21.2
	Not indicated	9	27.3

Table 3.5: Characteristics of participants in study 5 (UK).

4 Data analysis

4.1 Correspondence rating (studies 1 and 2)

Data from studies 1 and 2 were frequency counts, determined by the measurement method used (correspondence rating) and nature of the responses (nominal data). Therefore, a two-sample Chi-Square test was an appropriate method for analysis (see Foster, 1998: 21). The cross-tabulation comprised the 6 symbols x the 5 options (four attributes plus "none of these"). Results from the Chi-Square test indicated significant association between symbols and attributes. Study 1 (Kenya): χ^2=203.405; df=20; p<0.001; study 2 (UK): χ^2=80.639; df=20; p<0.001.

Symbol	**Studies 1&2** Correspondence rating	**Kenya (n=56)** % of responses	**UK (n=54)** % of responses	**Study 3** Comprehensibility judgement test	**Kenya (n=233)** % of population
Crystal 	Humanitarianism	6.8	10.3	Humanitarianism	30.5
	Protection	16.2	26.5	Protection	27.9
	Neutrality	**48.6**	**27.9**	Neutrality	35.4
	Universality	21.6	23.5	Universality	36.4
	None of these	6.8	11.8	**Mean**	**32.6**
Cross 	*Humanitarianism*	**37.1**	30.9	Humanitarianism	81.1
	Protection	30.7	**34.0**	Protection	78.1
	Neutrality	14.3	18.1	Neutrality	77.0
	Universality	17.9	17.0	Universality	78.0
	None of these	0.0	0.0	**Mean**	**78.6**
Heart 	Humanitarianism	12.2	3.3	Humanitarianism	39.8
	Protection	26.8	25.0	Protection	33.4
	Neutrality	**31.7**	**30.0**	Neutrality	36.9
	Universality	28.0	20.0	Universality	39.8
	None of these	1.2	21.7	**Mean**	**37.5**
Crosscent 	Humanitarianism	5.1	17.2	Humanitarianism	34.5
	Protection	12.8	17.2	Protection	31.5
	Neutrality	**47.4**	14.1	Neutrality	35.9
	Universality	30.8	**28.1**	Universality	34.2
	None of these	3.8	23.4	**Mean**	**34.0**
Lion and Sun 	Humanitarianism	6.0	20.0	Humanitarianism	25.1
	Protection	**77.6**	**50.0**	Protection	46.7
	Neutrality	4.5	8.6	Neutrality	36.5
	Universality	9.0	11.4	Universality	31.7
	None of these	3.0	10.0	**Mean**	**35.0**
Crescent 	Humanitarianism	17.2	22.5	Humanitarianism	50.5
	Protection	12.9	15.5	Protection	49.3
	Neutrality	32.3	21.1	Neutrality	56.1
	Universality	**37.6**	**29.6**	Universality	53.5
	None of these	0.0	11.3	**Mean**	**52.3**

Table 4.1: Summary of results from studies 1, 2, and 3.

Correlation between studies 1 and 2 was significant (r_S=0.693; n=30; p<0.01). Most frequent symbol-attribute ratings of correspondence are emboldened in column 3 and 4 in Table 4.1. The most frequent and second most frequent ratings of correspondence for the Cross were reversed across samples. In Kenya these were humanitarianism and protection, and in the UK these were protection and humanitarianism, respectively. It could be argued that the Cross corresponded with both attributes. This was an unsurprising outcome given the Cross' religious association and the affiliation it has had with the movement which bears its name (both of these were confirmed in studies 4 and 5; see Tables 4.2 and 4.3). In the case of the Crosscent, the most frequent rating of correspondence in Kenya was with neutrality; the UK sample rated the symbol corresponding *least* with this attribute. The second most frequent rating of correspondence in Kenya was with universality; the UK sample rated the symbol corresponding *most* with this attribute. It could be argued that there was greater agreement between samples concerning the universality attribute; the more so when one considers that the second most frequent rating of correspondence by the UK sample was "none of these" (see Table 4.1).

The statistically significant associations between symbols and attributes suggested a non-accidental and non-chance, and hence non-arbitrary, symbol-referent (signifier-signified) relationship, contrary to Saussure (cf. Cobley & Jansz, 1997) and in accord with Moriarty (1994). Of note also was the correspondence between the Crescent, a symbol classified initially as pictorial, and the relatively abstract attribute, universality. Further, it had been anticipated that in study 3, each symbol would be judged most comprehensible as a visual representation of the attribute(s) which it was rated as having greatest correspondence with in studies 1 and 2. As is evident from the comprehensibility judgement test results in column 6 in Table 4.1, this did not prove to be the case.

4.2 Comprehensibility judgement test (study 3)

4.2.1 Pilot study

A pilot study using separate questionnaires with red-on-white and black-on-white symbols was conducted during March 2002. The 18 respondents were part-time workers, mainly university students, at a Leicester factory. Results from this pilot study indicated that comprehensibility estimates for the red-on-white Cross, when compared to a black-on-white version, went up 16% (mean of 69.1% to 85.1%). Comparable figures for the red-on-white Crescent were up 1% (27.2% to 28.4%); red-on-white Crosscent down 3% (19.0% to 16.3%); and red-on-white Crystal up 9% (12.8% to 22.1%). It was clear that the red colour had a disproportionate effect on judgements of comprehensibility, especially with regard to the Cross. Black-on-white symbols were used throughout this investigation as recommended in ISO 9186: 2001.

4.2.2 Main study

Data from the main study (n=233) were analysed using a repeated measures ANOVA (see Foster, 1998: 190-195). The test of within-subjects effects (symbols) was significant: $F(5,1145)=134.437$; $p<0.05$; interaction between symbols and attributes was also significant: $F(15,1145)=2.427$; $p<0.05$; however, the test of between-subjects effects (attributes) was not significant: $F(1,229)=0.408$; $p=0.748$. In other words, comprehensibility estimates differed significantly between symbols but not between attributes. It was clear the significant main effects were the symbols. However, the significant interaction obtained was not informative (see Profile Plots in Appendix X). Points denoting Estimated Marginal Means were clustered for the pictorial Cross but not for the pictorial Lion and Sun. Similarly, points denoting Estimated Marginal Means were clustered for the familiar Cross and Crescent as they were for the unfamiliar Crystal, Heart, and Crosscent.

Correlation between the comprehensibility judgement test (carried out only in Kenya) and the Kenya correspondence rating test was barely significant (r_S=0.417; n=24; p=0.042); correlation between the judgment test (Kenya) and the UK correspondence rating test was not significant (r_S=0.274; n=24; p=0.195). Pairwise comparisons of main study 3 data (see Kinnear & Gray, 2000: 222-228) indicated that mean comprehensibility estimates between the Cross and Crescent differed significantly (p<0.05). Mean scores between these two symbols and the other four (Crystal, Heart, Crosscent, and Lion and Sun) differed significantly also (p<0.05). However, mean scores between these latter set of symbols did not differ significantly (p=0.088 to p=1.000). That notwithstanding, the mean scores provided a measure of symbol comprehensibility: the Cross and Crescent in first and second position and the other four symbols at third due to the statistically indistinguishable scores between them (see Table 4.4).

4.3 Comprehension test (studies 4 and 5)

4.3.1 Overview and tabulated summaries

The total number of responses in study 4, including identical or similar answers, was 141 (n=20). This represented 68 different meanings across the six symbols, an average of 11.3 per symbol (Table 4.2). Differences in the average number of meanings between the *initial* symbol classifications were slight – 12.3 meanings across the pictorial and 10.3 across the schematic/abstract categories (Table 4.4). The total number of responses in study 5 was 338 (n=33), representing 135 different meanings across the six symbols, an average of 22.5 per symbol (Table 4.3). Differences in the average number of meanings between the *initial* symbol classifications were not only greater in study 5 than in study 4 – 18.7 meanings across the pictorial and 26.3 across the schematic/abstract categories – but were also skewed in the opposite direction, i.e., a lower average between pictorial and

higher average between schematic/abstract symbols in study 5; the reverse was the case in study 4 (Table 4.4).

There appeared to be a clearly discernible difference between the Kenya and UK studies, and this related to the average number of meanings per symbol. It was twice the amount in the UK than it was in Kenya (22.5 and 11.3, respectively). Given the sample characteristics (post graduate design students in the UK and ordinary citizens in Kenya) the greater variety of symbol interpretations in the UK appeared to go against the logical expectation that design training and a generally higher level of formal education would bring about less disparate interpretations of visual representations. On the whole, however, there were many instances of similar interpretations of identical symbols between the two samples, the key difference being the frequency of these interpretations in each sample.

The proportion of responses of a religious nature was higher with regard to the Crescent than with the Cross in both studies (25.0% and 7.7% in Kenya, and 15.9% and 9.4% in the UK, respectively). This suggested the Crescent had greater religious symbolism than the Cross. Only five sets of responses from study 4 and three from study 5 proved "correct" with respect to the movement's attributes or the criteria for a new symbol proposed by the ICRC. These are emboldened in Tables 4.2 to 4.4 and were generated by the Cross, Crosscent, Lion and Sun, and Crescent. Overleaf are tabulated summaries of studies 4 and 5 data and proposed symbol semiosis. The symbol-by-symbol analysis which follows the summaries relates participant responses to Krampen's iconicity, indexicality, and symbolicity criteria (refer to Table 2.1).

Symbol *Graphical form*	Responses (Study 4 Kenya; n=20) 2 or more mentions indicated	Count	%	Proposed symbol semiosis
Crystal *Abstract*	Don't know	10	45.5	N/a
	Diversion/Sharp corner ahead	2	9.1	Symbolic
	Closed up/Imprisoned	2	9.1	Iconic
	Others (single-mentions)	8	36.4	-
	Total	22	100.1	-
	Variety of responses	11		-
Cross *Pictorial*	**Red Cross**	10	38.5	Iconic
	Relief/Aid/Help	5	19.2	Symbolic
	Death/Sorrow	3	11.5	Symbolic
	Church/Religion	2	7.7	Symbolic
	Humanity/Life	2	7.7	Symbolic
	Others (single-mentions)	4	15.4	-
	Total	26	100.0	-
	Variety of responses	9		-
Heart *Abstract*	Road traffic sign related	6	28.6	Symbolic
	Don't know	5	23.8	N/a
	Centre/Focussed	2	9.5	Iconic
	Others (single-mentions)	8	38.1	-
	Total	21	100.0	-
	Variety of responses	11		-
Crosscent *Schematic*	Don't know	10	45.5	N/a
	Union/Unity	5	22.7	Symbolic/Iconic/Indexical
	Others (single-mentions)	7	31.8	-
	Total	22	100.0	-
	Variety of responses	9		-
Lion and Sun *Pictorial*	Rastafarianism	5	19.2	Symbolic
	Brave/Tough/Strong	4	15.4	Iconic
	Protection	3	11.5	Iconic
	Fight/Conquer	3	11.5	Iconic
	Freedom	2	7.7	Symbolic
	Others (single-mentions)	9	34.6	-
	Total	26	99.9	-
	Variety of responses	14		-
Crescent *Pictorial*	Islam/Mosque	6	25.0	Symbolic
	Calm/Cool/Quiet	3	12.5	Iconic
	Don't know	3	12.5	N/a
	Eclipse	2	8.3	Iconic
	Others (single-mentions)	10	41.7	-
	Total	24	100.0	-
	Variety of responses	14		-
	Total number of responses	141		
	Total number of different meanings	68		
	Average meanings per symbol	11.3		

Table 4.2: Summary of study 4 data and proposed symbol semiosis.

Symbol *Graphical form*	Responses (Study 5 UK; n=33) 3 or more mentions indicated	Count	%	Proposed symbol semiosis
Crystal *Abstract*	Warning/Alert	8	14.5	Symbolic
	Don't know	6	10.9	N/a
	Balance/Stable	5	9.1	Iconic
	Building	4	7.3	Iconic
	Box/Boundary	3	5.5	Iconic
	Others (two-mentions)	10	18.2	-
	Others (single-mentions)	19	34.5	-
	Total	55	100.0	-
	Variety of responses	29		-
Cross *Pictorial*	Hospital/Healthcare	23	35.9	Symbolic
	Ambulance/Rescue	11	17.2	Symbolic
	Cross/Red Cross	7	10.9	Iconic
	Religious/Church	6	9.4	Symbolic
	Safety	3	4.7	Symbolic
	Others (two-mentions)	8	12.5	-
	Others (single-mentions)	6	9.4	-
	Total	64	100.0	-
	Variety of responses	15		-
Heart *Abstract*	Don't know	7	14.0	N/a
	Directional	5	10.0	Iconic
	Warning/Danger	4	8.0	Symbolic
	Traffic related	3	6.0	Symbolic
	Rigid	3	6.0	Iconic
	Unsteady	3	6.0	Iconic
	Important	3	6.0	Symbolic
	Others (two-mentions)	2	4.0	-
	Others (single-mentions)	20	40.0	-
	Total	50	100.0	-
	Variety of responses	28		-
Crosscent *Schematic*	Don't know	10	21.7	N/a
	Company logo	5	10.9	Symbolic
	Religious	4	8.7	Symbolic
	Tree/Flower	3	6.5	Iconic
	Conflict/Revolution	3	6.5	Iconic
	Others (two-mentions)	8	17.4	-
	Others (single-mentions)	13	28.3	-
	Total	46	100.0	-
	Variety of responses	22		-
Lion and Sun *Pictorial*	Dominance/Power	12	20.0	Iconic
	War/Fight	10	16.7	Iconic
	Brave	7	11.7	Iconic
	Royalty	6	10.0	Symbolic
	Victory	5	8.3	Symbolic
	National flag	5	8.3	Symbolic
	Arm	3	5.0	Iconic
	Others (two-mentions)	6	10.0	-
	Others (single-mentions)	6	10.0	-
	Total	60	100.0	-
	Variety of responses	16		-

Table 4.3 is continued on the next page.

Symbol *Graphical form*	**Responses (Study 5 UK; continued)** 3 or more mentions indicated	**Count**	**%**	**Proposed symbol semiosis**
Crescent *Pictorial*	Star/Moon	14	22.2	Iconic
	Islamic	10	15.9	Symbolic
	Flag/Heraldry	7	11.1	Symbolic
	Smile	4	6.3	Iconic
	**Mercy/Hope**	4	6.3	Symbolic
	Don't know	2	3.2	N/a
	Not indicated	1	1.6	-
	Others (two-mentions)	4	6.3	-
	Others (single-mentions)	17	27.0	-
	Total	63	99.9	-
	Variety of responses	25		-
	Total number of responses	338		
	Total number of different meanings	135		
	Average meanings per symbol	22.5		

Table 4.3: Summary of study 5 data and proposed symbol semiosis (continued from previous page).

4.3.2 Symbol-by-symbol analysis: study 4 (Kenya)

4.3.2.1 The Crystal

Most responses to the Crystal were 'don't know' (10 counts or 45.5% of the responses) which suggested that this abstract symbol had 'no pre-existing connotations' as anticipated by Foster (see Section 1.2.1). However, the symbol also generated a large proportion of single-mention meanings (8 counts or 36.4%), which pointed to its unfamiliarity in the Kenyan context. These responses could also be interpreted as evidence of the existence of a variety of connotations.

Notable among other responses to the Crystal were the road traffic signing and enclosure related responses (2 counts each or 18.2% of the total). The former could be termed 'symbolic' interpretations and are a cause for concern. In the United States where the class of road traffic warning signs is 'diamond-shaped' (Eliot, 1960: 63), one would expect this symbol to generate a fair amount of traffic-related responses, given that the responses here are from Kenya where this shape of road sign does not exist. The latter 'closed up/imprisoned' responses appear to be pictorial readings of the Crystal.

4.3.2.2 The Cross

The 'Red Cross' responses to the Cross, despite a black-on-white graphic, were classifiable as iconic interpretations (10 counts or 38.5%). However, 46.1% of responses to the Cross suggested it was being interpreted symbolically. These responses include 'relief/aid/help' (5 counts or 19.2%); 'humanity/life' (2 counts or 7.7%); 'death/ sorrow' (3 counts or 11.5%); and 'church/religion' (2 counts or 7.7%). The first two sets of responses accord with the movement's humanitarian attribute.

4.3.2.3 The Heart

A large proportion of responses to the Heart were single-mentions (8 counts or 38.1%) and a significant proportion were 'don't know' (5 counts or 23.8%), which may suggest its unfamiliarity. However, the rest of the interpretations were mainly road traffic sign related (6 counts or 28.6%). This was consistent with its triangular shape which symbolises "stop" or "warning" in the road traffic context in Kenya. The symbol also inspired the 'centre/focussed' responses, which would appear to be pictorial readings of the symbol.

4.3.2.4 The Crosscent

Most responses to the Crosscent were 'don't know' (10 counts or 45.5%) which suggested that it had 'no pre-existing connotations'. However, a significant proportion were single-mentions (7 counts or 31.8%), which suggested a variety of connotations. Another set of responses (5 counts or 22.7%) referred in some way to a 'union' or 'unity' between Christianity and Islam or between the Cross and the Crescent symbols. The former are classifiable as symbolic and the latter iconic interpretations. However, the composite cross-and-crescent design seemed to have re-oriented the religious significance of the component symbols from overt religious

symbolism to the connotation of 'unity'. This could be considered an indexical reading of the Crosscent (see Table 2.1).

4.3.2.5 The Lion and Sun

Unsurprisingly, a large proportion of responses to the Lion and Sun were classifiable as iconic (10 counts or 38.4%) as they related to leonine characteristics or the literal reading of the pictorial representation. Noteworthy among these was 'protection' which was the attribute which the symbol had corresponded with in studies 1 and 2. The Lion and Sun emblem has never been used in Kenya to symbolise the movement. It was therefore safe to conclude that the references to (and correspondence with) protection were generated by the iconic nature of the symbol, as opposed to its symbolism of the protective attribute of the movement. A significant proportion of responses to this symbol were single-mentions (9 counts or 34.6%), while the remainder could be classified as symbolic (7 counts or 26.9%).

4.3.2.6 The Crescent

A significant proportion of responses to the Crescent were single-mentions (10 counts or 41.7%), suggesting a variety of connotations. Six responses (25%) revolved around Islamic themes; these could be considered symbolic references. Another set of responses (5 counts or 20.8%) could be considered iconic – 'calm/cool/quiet' and 'eclipse' – they appeared to refer to features of the moon. Three responses (12.5%) were 'don't know', making it the only symbol classified initially as pictorial which generated this response.

4.3.3 Symbol-by-symbol analysis: study 5 (UK)

4.3.3.1 The Crystal

Surprisingly for a symbol classified as abstract, a significant proportion of responses to the Crystal could be classified as iconic. Indeed, the proportion of apparently

iconic interpretations was larger than symbolic interpretations (12 counts or 21.9% compared to 8 counts or 14.5%, respectively). The most frequent response to the Crystal, 'warning/alert', could be considered symbolic (8 counts or 14.5%). The symbol generated a large proportion of single-mention meanings (19 counts or 34.5%), which pointed to the existence of a variety of other connotations. The proportion of 'don't knows' was significantly lower in the UK sample (6 counts or 10.9%) than in the Kenya sample (10 counts or 45.5%).

4.3.3.2 The Cross

Symbolic connotations dominated responses to the Cross (43 counts or 67.2%) with healthcare and ambulance related interpretations leading (23 counts or 35.9% and 11 counts or 17.2%, respectively) and a smaller proportion of religious and safety related connotations (6 counts or 9.4% and 3 counts or 4.7%, respectively). The 'Cross/Red Cross' responses (7 counts or 10.9%) could be considered iconic interpretations, and together with 'safety' (if interpreted as connoting protection), could be considered relevant to the movement.

4.3.3.3 The Heart

The largest proportion of responses to the Heart were single-mentions (20 counts or 40.0%) indicating the existence of a variety of connotations, while the most frequent response was 'don't know' (7 counts or 14.0%). Surprisingly for a symbol categorised as abstract, a slightly larger proportion of responses could be termed iconic (11 counts or 22.0%) rather than symbolic (10 counts or 20.0%). The proportion of traffic related connotations were far lower in the UK (3 counts or 6.0%) than in Kenya (6 counts or 28.6%).

4.3.3.4 The Crosscent

The most frequent response to the Crosscent was 'don't know' (10 counts or 21.7%). It also generated a large proportion of single-mention meanings (13 counts or 28.3%) which suggested a variety of connotations. Most responses to the symbol could be termed symbolic (9 counts or 19.6%), including the four religious interpretations. These, together with the three 'conflict/revolution' responses, were counter to the unity connotations the Crosscent had engendered in Kenya. The 'conflict/revolution' and 'tree/flower' responses could be considered iconic interpretations (6 counts or 13.0%).

4.3.3.5 The Lion and Sun

Unsurprisingly, a significant proportion of responses to the Lion and Sun could be classified as iconic (32 counts or 53.4%) while half this proportion could be termed symbolic (16 counts or 26.6%).

4.3.3.6 The Crescent

The largest proportion of responses to the Crescent were single-mentions (17 counts or 27.0%), suggesting a variety of connotations, while the most frequent, 'star/moon', could be termed iconic (14 counts or 22.2%). However, a slightly larger proportion of responses could be classified as symbolic (21 counts or 33.3%) rather than iconic (18 counts or 28.5%). The Crescent generated in this study a small amount of responses that chimed with the humanitarian attribute of the movement ('mercy/hope'; 4 counts or 6.3%) and was the only symbol classified initially as pictorial which generated 'don't know' responses (2 counts or 3.2%).

4.4 Summary

There was evidence from studies 1 and 2 by way of the statistically significant and cross-culturally correlated correspondence ratings that suggested the symbol-

attribute couplings were not only visually *and* semantically motivated, but that the relationship could also be interpreted as a form of both iconic *and* indexical signification. Thus, the signifier-signified relationship appeared to be non-arbitrary. The statistically significant differences in mean comprehensibility estimates in study 3 were between familiar and unfamiliar symbols, and not between symbols of differing pictorial, schematic, or abstract graphical form. Results from studies 4 and 5 suggested the pictorial-to-abstract characteristics of the symbols may have had an effect on participant responses by way of the differences in the average number of meanings between the initial pictorial and schematic/abstract symbol categories. However, differences in the average number of meanings between these symbol categories in study 4 were not only slight but counter intuitive – the average was marginally higher across pictorial symbols than across schematic/abstract symbols. The reverse was the case in study 5. Results from studies 4 and 5 suggested also that irrespective of graphical form, the symbols generally signified meaning iconically and symbolically.

The Crescent was the only symbol classified initially as pictorial which generated 'don't know' responses in studies 4 and 5. This, together with its correspondence with the relatively abstract attribute universality in studies 1 and 2, suggested it belonged in the schematic/abstract, as opposed to the pictorial, symbol category. As a result of this re-classification, the test symbols' pictorial, schematic, and abstract graphical forms appeared to mirror more closely the concrete-to-abstract language of the attributes (see Table 4.4). Differences in the average number of meanings between pictorial and schematic/abstract symbol categories were negligible in study 4 after re-classifying the Crescent (11.5 and 11.25 compared to 12.3 and 10.3 before re-classification, respectively), and grew in study 5 by way of a lower average across pictorial symbols and negligible change across schematic/abstract symbols (15.5 and 26.0 compared to 18.7 and 26.3, respectively).

Test symbols	Lion and Sun 	Cross 	Crescent 	Crosscent 	Heart 	Crystal 
Re-classification	*Pictorial*		*Schematic/Abstract*			
Study 1 (Kenya) and Study 2 (UK) Correspondence rating (n=110) *'The idea or object represented…'*	*Protection*	*Protection Humanitarianism*	*Universality*	*Universality*	*Neutrality*	*Neutrality*
Semantic polarity of referent-attributes	*Concrete*					*Abstract*
Symbol Semiosis at the denotative level	*Simultaneously and indivisibly Iconic and Indexical*					
Study 3 (Kenya) Mean comprehensibility estimate (% of pop.) and rank* (n=233)	35.0% **3**	78.6% **1**	52.3% **2**	34.0% **3**	37.5% **3**	32.6% **3**
Study 4 (Kenya) Comprehension test (n=20) *'What do you think this symbol means?'* Most frequent responses (top down)	Rastafarian Brave/ Tough/ Strong **Protection** Fight/ Conquer Freedom	**Red Cross** **Relief/ Aid/Help** Death/ Sorrow Church/ Religion **Humanity/ Life**	Islam/ Mosque Calm/ Cool/ Quiet Don't know Eclipse	Don't know **Unity/ Union** (between Cross & Crescent/ Christianity & Islam)	Road sign/ Traffic/ Stop/ Danger/ No parking Don't know Centre/ Focussed	Don't know Diversion/ Sharp corner ahead Closed up/ Imprisoned
Meanings per symbol	**14**	**9**	**14**	**9**	**11**	**11**
Symbol Semiosis at the interpretive level and relative proportions	*Iconic > Symbolic*	*Symbolic >Iconic*	*Symbolic >Iconic*	*Symbolic =Iconic =Indexical*	*Symbolic >Iconic*	*Symbolic =Iconic*
Study 5 (UK) Comprehension test (n=33) *'What do you think this symbol means?'* Most frequent responses (top down)	Dominance/ Power War/Fight Brave Royalty Victory National Flag Arm	Hospital/ Healthcare Ambulance/ Rescue **Cross/ Red Cross** Religious/ Church **Safety**	Star/Moon Islamic Flag/ Heraldry Smile **Mercy/ Hope** Don't know	Don't know Company logo Religious Tree/Flower Conflict/ Revolution	Don't know Directional Warning/ Danger Traffic related Rigid Unsteady Important	Warning/ Alert Don't know Balance/ Stable Building Box/ Boundary
Meanings per symbol	**16**	**15**	**25**	**22**	**28**	**29**
Symbol Semiosis at the interpretive level and relative proportions	*Iconic > Symbolic*	*Symbolic >Iconic*	*Symbolic >Iconic*	*Symbolic >Iconic*	*Iconic > Symbolic*	*Iconic > Symbolic*

**Mean comprehensibility estimates of similarly ranked symbols (study 3) were statistically indistinguishable (p>0.05).*

Table 4.4: Summary of research results (n=396).

5 Discussion of the findings

5.1 Symbol semiosis: post-research

Results from studies 1 and 2 appeared to support hypotheses H1 and H2; this is evidenced by the correspondence between pictorial symbols and the concrete attributes protection and humanitarianism, and the correspondence between schematic and abstract symbols and the abstract attributes universality and neutrality (see the top four rows in Table 4.4). However, results from studies 4 and 5 suggested that iconic, indexical, and symbolic symbol semiosis was not exclusive to symbols of respective pictorial, schematic, and abstract graphical forms, thus refuting hypotheses H2 and H3 (see Symbol Semiosis rows in Table 4.4).

The results appeared to substantiate the initial symbol classifications in five out of six cases, implying the theoretical and descriptive characterisation of visual representations exemplified in Table 2.2 could be validated empirically. The re-classification of the Crescent was based on evidence from studies 1 and 2 and studies 4 and 5 viz. its respective correspondence with the relatively abstract attribute, universality, and generation of 'don't know' responses.

The remainder of this chapter argues that, even though these distinct pictorial, schematic, and abstract graphical characteristics may indeed represent the material and perceptual differences between symbols, the semiosis of these apparently differing graphical forms (i.e., the process by which the symbols signify meaning) overlaps to the extent that graphical form has limited functional utility. That notwithstanding, by analysing the semiosis of symbols of differing graphical forms, one has the potential to gauge with greater accuracy symbol functioning, and hence recommend specific symbol types for specific uses.

5.1.1 Pre-existing connotations

If we construe symbol designs as the 'material aspect' of graphical symbols, and symbol referents as the 'mental concept' the symbol ought to engender in viewers, it could be argued the symbol-attribute correspondences in studies 1 and 2 represented a close approximation of Saussure's 'signifier-signified' dyad (cf. Cobley & Jansz, 1997: 12). If we interpret the correspondences as connotations, this implies the test symbols were not devoid of pre-existing connotations.

It appears the graphical form of the symbols did not determine the quantity and variety of interpretations in the comprehension test carried out in Kenya. This may be deduced from the negligible difference between the mean number of meanings between pictorial and schematic/abstract symbol categories in study 4, unlike the UK test where the average was higher in the latter category (study 5). Differences in the studies notwithstanding, not only did results from studies 4 and 5 provide further evidence that abstract symbols were not devoid of pre-existing connotations, the UK test indicated that schematic/abstract symbols had a larger proportion of pre-existing connotations than pictorial symbols.

One may argue that the shape of the Heart and Crystal are unfortunate in that they resemble respective European and American road traffic warning signs, and hence these abstract symbols had prior-meanings. (This may explain the reported traffic-signing connotations. However, while the triangular shape is employed in Kenya and the UK, the diamond is not.) Nonetheless, the same argument would apply to the Cross and Crescent and their religious connotations. The Cross suffers also from an unfortunate name – it is likely a different history would have unfolded had it been named the "Red Plus" (in which case it would have been classified in this study as an abstract symbol). In sum, pictorial, schematic, and abstract symbols all appeared to have pre-existing connotations.

5.1.2 Simultaneous iconic and indexical symbol semiosis

In studies 1 and 2, two symbols classified initially as pictorial, the Lion and Sun, and Cross, appeared to be identified with protection or humanitarianism. Both these attributes were considered relatively concrete. Three symbols classified initially as schematic and abstract, the Crosscent, Heart, and Crystal, appeared to be identified with universality or neutrality. Both these attributes were considered relatively abstract. This suggested a visual-verbal resonance between pictorial symbols and concrete referents, and between schematic or abstract symbols and abstract referents. The relationship between graphical form and semantic meaning became clearer after re-classifying the Crescent (cf. Table 2.2 and Table 4.4).

It appears the correspondence ratings were attributable to the parallel and complimentary differences between the *graphical form* of the test symbols on one hand, and the *semantic polarity* of the attributes on the other, as illustrated in the top four rows of Table 4.4. Each of these components (graphical form *and* semantic polarity) appears to have contributed to the overall correspondence rating results. Thus, the symbol-attribute correspondences could be construed to be a form of indexicality. To paraphrase Peirce (Hoopes, 1991: 240), without the respective pictorial-to-abstract graphical forms and concrete-to-abstract attributes, there would probably have been no correspondences approximate to those demonstrated here. Consequently, this would appear to demonstrate that 'causality can apply to graphic images', contrary to the misgivings of Smith (1986: 201).

The symbols were also iconic, if the correspondences were indeed 'motivated', in the Saussurean sense (Krampen, 1983: 6; Moriarty, 1994: 1), by the visual and semantic link between particular graphical forms and attribute concreteness or abstractness, i.e., by means of visually analogous graphical forms and referent meanings. If we accept this, it suggests that the symbols functioned *simultaneously*

as *icons* and as *indexes* of the respective attributes at the referent denotation level (cf. Krampen, 1983: 7-17). Some responses to the Crosscent in study 4 appeared also to demonstrate iconicity and indexicality (see Section 4.3.2.4), which suggests the phenomena may exist at the symbol interpretation level also. It would appear symbol iconicity or indexicality would not be considered a characteristic exclusive to symbols of a particular graphical form. The aspect of 'symbolicity' as defined by Krampen (1983: 14) would appear inapplicable at this initial referent denotation stage (see Table 2.1).

5.1.3 Simultaneous iconic and symbolic symbol semiosis

The apparent manifestation of principally iconic and symbolic readings of the test symbols in studies 4 and 5 could be interpreted as a demonstration of the semiotic 'dimensions' of each symbol (Krampen, 1983: 14). This suggested that symbol iconicity or symbolicity was also not exclusive to symbols of either pictorial, schematic, or abstract graphical form. This outcome appeared to support Scott (1994), who had observed: 'As our pictorial vocabulary expands, previously learned schemata are processed more readily, which causes us to see styles that once seemed highly mannered [e.g., abstract or schematic symbols] as natural [i.e., iconic]' (p. 261). Interestingly, the UK sample in study 5 appeared to 'see' more iconic than symbolic meanings in the two abstract symbols, Heart and Crystal; the reverse was the case in Kenya (study 4).

5.1.4 Is the symbol-referent relationship arbitrary?

Given the pictorial-to-abstract characteristics of the symbols and the concrete-to-abstract language of the attributes, the symbol-attribute couplings did not appear to be arbitrary. Rather, they appeared to be visually and semantically motivated. This validated Moriarty's (1994) assertion that '... arbitrariness [between signifier and signified as conceptualised by Saussure] is true in most spoken and written

language ... however, that may not be so for other types of signs such as visuals that provide stylized cues to stimulate recognition through resemblance' (p. 1). 'Stylized cues' is interpreted here as "graphical form". Equally noteworthy is the observation that the correspondences established in studies 1 and 2 did not appear to have been 'established and sustained by convention' (Kress, 1998: 73). There is no evidence to suggest that the movement's attributes have been proposed or indeed identified previously as constituting what the movement's emblems stand for. That was an innovation of this study.

Further, when one looks at the number of 'don't know' responses in studies 4 and 5, one notices that the frequency of this answer was prevalent with respect to schematic and abstract symbols. The pictorial Lion and Sun, and Cross did not generate any 'don't know' responses. This does not seem to be arbitrary. It appears to be a consequence of the perceptual differences in graphical form and symbol familiarity and unfamiliarity. Thus, pictorial symbols appear to be generally meaningful in some respect (though not necessary as the movement's attributes), while abstract and schematic symbols appear less so. Nonetheless, the quantity and variety of meanings across symbols suggest also that symbol familiarity and unfamiliarity may have had a role in the generation of 'don't know' responses rather than these being solely a consequence of schematic or abstract symbols.

5.1.5 Summary

The phenomena described here indicating a difference in the semiosis of graphical symbols at the referent denotation and symbol interpretation levels of visual communication does not appear to have been observed previously or reported in the graphical symbols research literature. Further, the difference in the semiosis of graphical symbols at the two levels of analysis raises the question of whether the characterisation of visual representations by previous authors on which the initial

classification of the test material were based is valid (cf. Table 2.2); and consequently, whether Peirce's iconicity, indexicality, and symbolicity theories hold true in the context considered in this study.

The characterisation of visual representations as pictorial, schematic, or abstract seems reasonable. Symbols have distinct global characteristics. Hence there is some validity in classifying them according to these characteristics. However, the validity of these classifications and Peirce's triadic system appears to collapse when symbols are put to actual use as potential representations and communicators of information. Thus, the distinct graphical characteristics of individual symbols may have appeared to determine their correspondence with specific attributes in studies 1 and 2. However, the suggestion that these correspondences were simultaneously iconic and indexical implied the pictorial, schematic, and abstract graphical symbol forms were incongruent with Peirce's iconic, indexical, and symbolic signification theories in the manner envisaged earlier (see Section 2.3.2 and 2.3.3).

Further, the "mixed" semiosis of the symbols at the symbol interpretation level was most probably a manifestation of the 'sophisticated cognitive steps' and reconciliation of visual data (Scott, 1994: 265-266) which viewers bring to bear when interpreting visual information. This was exemplified by responses to the Crosscent in study 4. The schematic design appeared to direct interpretation towards a new reading of the Cross and Crescent symbols. Subsequent interpretation of the Crosscent as a sign of unity would therefore appear to make it an indexical sign. This represented a perceptive step by participants when one considers that the Cross is not fully formed and the Crescent, such as it is, is only suggested by the background showing through the foreground colour. As Goodman (1976) had observed, human visual perception 'does not so much mirror as take

and make' (p. 7-8). Schematisation, then, would appear to be a useful design tool for re-orienting symbol interpretations.

Nonetheless, human creative, cognitive and perceptual processes appeared to conspire against a general pictorial-iconic, schematic-indexical, and abstract-symbolic 'mode of correspondence' (Richards, 2000: 97). As a consequence, the question of whether the interpretation of symbols can, indeed, be constrained by pictorial, schematic, or abstract graphical forms of representation remains largely unanswered.

5.2 The comprehensibility judgment test results

5.2.1 Symbol familiarity as a possible confounding factor

Given the results from studies 1 and 2, the lack of statistically significant differences between attributes in study 3 was surprising. This was the more so when prior research by Young and Wogalter (2000/2001) had demonstrated that results from correspondence rating and comprehensibility judgement tests could be correlated to a statistically significant level. (Hence results from the former test could be used as predictors of results in the latter test.) Correlation between the correspondence rating and comprehensibility judgement tests carried out in Kenya was barely significant ($p=0.042$). Correlation between the UK correspondence rating test and the judgment test (carried out only in Kenya) was not significant ($p=0.195$).

The only statistically significant differences in the comprehensibility judgment test results were between the Cross and the Crescent, and between these two symbols and the other four, the Lion and Sun, Crosscent, Heart, and Crystal. Scores between this latter set of symbols did not differ significantly. Given their pictorial, schematic, and abstract characteristics, and the lack of statistically significant

differences between them, it would appear that graphical form did not affect judgements of symbol comprehensibility. Symbol familiarity may have. The Cross and Crescent are familiar symbols in Kenya. Respondents may have judged these symbols more comprehensible than the others for this reason, ignoring, as it were, the symbol-referent correspondences established in studies 1 and 2. This may explain the relatively higher estimates of comprehensibility with regard to the Cross and Crescent and lower estimates with regard to the other four symbols.

5.2.2 The use of different samples

Young and Wogalter (2000/2001) had anticipated lack of statistically significant correlations between correspondence rating, comprehensibility judgement, and comprehension test results if *different samples* were used in the *different tests* (p.131). In the present study, not only were different samples used in the different tests (studies 1, 2, 3, 4 and 5), but also, four separate samples evaluated each attribute against the six symbols in the comprehensibility judgement test (study 3). Thus, a total of eight different samples participated in the five studies.

It is not possible at this stage to state categorically whether the lack of statistically significant differences between attributes in the comprehensibility judgement test which resulted in the barely- and non-significant correlations between this test and the two correspondence rating studies was a consequence of using different samples. This would seem plausible when the results from studies 1 and 2 are seen against those of study 3 in the sense that studies 1 and 2 demonstrated statistically significant associations between symbols and attributes. Thus, symbol-attribute correspondence should have translated into symbol-attribute comprehensibility along the same attribute (see Table 4.1). The Crystal was expected therefore to have been judged more comprehensible as a visual representation of neutrality

rather than of humanitarianism, protection, or universality and so on. As Table 4.1 indicates, this and other "predictions" were not sustained in study 3.

It is the author's contention that using different samples does not, in itself, lead to weak correlations or to correlations that do not approach statistical significance in same-procedure experiments. This is demonstrated by the cross-cultural correspondence rating studies conducted in Kenya and the UK. Further, statistically significant correlations have been achieved in studies where different samples performed different tasks (e.g., Brugger, 1994; Zwaga, 1989). Moses et al. (1984) have argued also that using different samples reduced the chance of task performance interaction, thus any correlations between tasks offers greater reliability of individual task and overall test results (p. 237). It could be argued therefore that using different samples in this type of investigation is more rigorous than when the same subjects are used in the different tests. Using different samples also improves representativeness, hence the validity and generaliseability of the outcomes. The lack of statistically significant differences between attributes in the comprehensibility judgement test which may have resulted in the barely- and non-significant correlations between this test and the correspondence rating studies may be an indicator of a methodological weakness in the former test (see below).

5.2.3 Possible weakness in the comprehensibility judgement test

In the comprehensibility judgement test, each participant evaluated one attribute against the six symbols. Hence four samples comprised study 3, one group for each attribute. The attributes were therefore the between-subject factors and the symbols the within-subject factors in this mixed-design repeated-measures experiment. Set up in this way, respondents were able to discriminate across *all* the symbols and presumably make more definitive, albeit varying, decisions about the comprehensibility of individual symbols as visual representations of each attribute.

The statistically significant differences in mean scores between the Cross and the Crescent, and between these two symbols and the other four (Lion and Sun, Crosscent, Heart, and Crystal), indicated that this was probably the case. The individual attributes, however, were evaluated by different individuals and hence respondents were unable to make the same kind of judgements with regard to the different attributes.

Methologically then, it would be expected that there would be greater qualitative judgements, and hence a quantitative difference, in rating what was set *before* each participant (this was exemplified by the statistically significant differences between some symbols, the within-subject factors) compared with what was set *between* participants (exemplified by the lack of statistically significant differences between the attributes, the between-subject factors).

Conventional public information and safety symbol testing procedures employ one referent for any number of symbol variants, so there are no between-subject factors. This would not have been practical in this study because one of the objectives was to gauge the suitability of the six symbols to represent visually the different attributes. Nevertheless, this methodological departure from the norm uncovered a potential weakness in the test which may apply to other procedures which have between-subject factors. This calls for further investigation. That said, the resolution of this apparent weakness in the comprehensibility judgement test may not be critical because the test is rarely employed as a stand-alone method for evaluating graphical symbols. It is more often used in concert with comprehension testing as a predictor of comprehension test results (see Zwaga, 1989).

5.2.4 The question of implausible outcomes

If graphical form *and* symbol familiarity are not capable of constraining the extraneous interpretation of symbols as the results from the comprehension tests seem to suggest (thus reducing the quantity and variety of symbol interpretations), then what would? To the extent that this outcome appears implausible, the fact that it is derived from results acquired through well established public information and safety symbol research methods which constitute an international symbol testing standard would suggest an outcome of empirical and methodological significance.

On the one hand, it lends credence to Kress' (1998: 55) assertion that the 'visualisation' of verbal language is not as 'unproblematic' as the relatively rapid quantitative dominance of the visual medium over the verbal alternatives would seem to imply, as manifested in the rate at which concepts, messages, processes and the like are translated into often incomprehensible or confusing symbols for public information, education, corporate communications, human-computer interaction, appliance use, and wayfinding, to name a few areas of application.

On the other hand, one of the reasons why the finding that graphical form *and* symbol familiarity appear incapable of reducing the quantity and variety of symbol interpretations would seem implausible could be because empirical research which evaluates the relative effectiveness of symbols of differing graphical forms as constituted here is hard to come by, at least in the domain of public graphics. More work in this area along the lines described in this study would substantiate or refute this rather implausible finding.

Another outcome which appears implausible relates to the barely- and non-significant correlations between the correspondence rating tests and the

comprehensibility judgement test. In the absence of definitive evidence to support the observations that, (a) using different samples in the different tests may have confounded some of the test results, and (b) there is a methodological weakness in the comprehensibility judgement test, the barely- and non-significant correlations suggest a symbol's visual appropriateness with its referent does not lead necessarily to the effective communication of the "appropriately visualised" referent. This goes against common sense and the findings from previous studies (see Section 2.5 and 3.2 for relevant references). The contradiction lends credence to the suggestion that symbol familiarity may have informed judgements of symbol comprehensibility. A recommendation would be to evaluate existing symbols and novel designs separately. Evidence from previous research (see above) indicates that symbols in current use and new designs are often tested side-by-side. Without a procedure to gauge and counteract the confounding influence of participant familiarity with test material, the results obtained may not identify the most effective designs but rather, the most familiar ones.

5.2.5 Application of ISO 9186: 2001 outside its previous domain of use

The results here indicate that ISO 9186: 2001 is, in most part, adequate to the task of evaluating symbols other than those in the public information and safety symbol domains. There is however one caveat: the to-be-represented entity would have to be amenable to decomposition into intelligible, unambiguous, verbal referents. This research demonstrated how this could be achieved, by identifying the movement's key attributes and proposing them as the symbol referents.

Further, the role played by the correspondence rating studies in assessing the appropriateness of the movement's current and proposed symbols to represent visually its attributes raises a question regarding the utility of ISO 9186 in areas where symbols are not designed necessarily to communicate specific information

but rather, to represent corporate entities, public service and volunteer organisations, and the like. In such situations, correspondence rating would indicate the level of appropriateness between the decomposed referent propositions and the proposed symbols. As such, it could be considered a useful "pre-testing" procedure. The results here indicate it is advisable to use a similar procedure as a supplement to the ISO tests within such contexts.

5.3 Implications for the International Red Cross and Red Crescent Movement

5.3.1 The paradox presented by the Cross

It should be acknowledged that the Red Cross, Red Crescent, and Red Lion and Sun were not designed specifically for the movement; they were appropriated from other sources (see Bugnion, 1977). That notwithstanding, it was apparent from this investigation that the Cross possessed – or has over time taken on – connotations relevant to the movement, and the Crescent much less so. Results from the open-ended comprehension tests, however, confirmed that both the Cross and the Crescent were not devoid of religious connotations. Responses to the Lion and Sun which were considered relevant to the movement appeared to be iconic, rather than movement inspired. Given that these symbols have been official emblems for the movement for over a century, the expectation that any negative connotations would subside over time would seem far fetched, in particular the religions ones accruing to the Cross and Crescent. If indeed these religious connotations are at the root of the emblem problem, it is difficult to understand, from a purely symbol design point of view, why a decision about the emblems has been so protracted (see Sommaruga, 1992). The presence now of empirical data to confirm that both the Cross and the Crescent are not devoid of religious connotations should lend credence to the advocates of a new symbol for the movement.

The Crosscent, Heart, and Crystal were new designs. It would have been fortuitous, therefore, for these symbols to have been more accurately comprehensible or interpretable as visual representations of the movement's attributes. Indeed, results from studies 4 and 5 indicated that all the symbols were, in most part, more familiar as representations of other entities/concepts rather than the movement, or were plainly unfamiliar. That notwithstanding, the correspondence rating studies demonstrated that the symbols, irrespective of origin, corresponded visually to some extent, with particular attributes of the movement.

In this regard, the Cross achieved correspondence with at least two attributes, namely humanitarianism and protection. It was also the most comprehensible symbol according to the comprehensibility judgement test mean scores. In the open-ended comprehension test, it generated responses which accorded with the name, and humanitarian and protective attributes of the movement. Put together, these results would seem to point to the Cross as the most suitable emblem from the six test symbols. Unfortunately, that would have us back exactly where the problem originated 140 years ago, when the Red Cross was proposed as the symbol for the Societies for Relief to the Military Wounded. This suggests we take a look at other outcomes of this investigation (see below).

5.3.2 The most suitable symbol for the movement

Results from studies 4 and 5 indicated that the Lion and Sun, and Heart and Crystal had unhelpful connotations of a political-cultural and road traffic signing nature, respectively. These connotations have the potential to present the same challenges as those posed by the religious connotations of the Cross and the Crescent. The Crosscent generated a small proportion of responses in study 5 that would be considered negative ('conflict/revolution'). However, the 'unity/union' connotations it engendered in study 4 are positive.

For one, they indicate that the composite cross-and-crescent design re-oriented the component symbols' religious connotations to that of 'unity/union', a useful manoeuvre given the genesis of the emblem problem. Secondly, when seen against the ICRC's brief for a symbol compatible with the ideal of unity (see below), the 'unity/union' connotations chime with another aspect of graphic symbology, that of an 'intuitively knowable' symbol, i.e., 'the viewer can place the correct interpretation on the symbol at first sight' (Foster, 1990: 161).

Indeed, this is one of several instances where this symbol meets some of the design-related criteria proposed by the ICRC addressed in this research. The criteria are reproduced again for ease of reference.

1 Any solution must be assessed primarily in the light of the protection afforded to victims and must actually lead to an improvement in such protection.

2 Any solution must be based on the existence of the two emblems currently in use, that is, the cross and the crescent, which are de facto placed on an equal footing and which are known worldwide.

3 Any solution must avoid creating new obstacles for the Movement's ideal of unity and must, on the contrary, be compatible with that ideal.

4 Even though this ideal of unity naturally extends to the emblem, the objective of having a single emblem for both protective and indicative purposes is not on the agenda at present; the aim is to solve the difficulties faced by States and National Societies that are unable to use either the red cross or the red crescent.

5 Any solution must be capable of settling these problems without creating new ones for National Societies which have no difficulties in this respect, and which must be able to carry on with their present emblems (status quo).

6 The issue of the emblem must not cause division within the Movement; any solution must be very widely acceptable and any resolution on this crucial matter must be adopted by consensus (from Bugnion, 2000: 32-33).

Specifically, the Crosscent meets criteria 2, 3, and 4. The unity connotations are in direct accord with criteria 3. The composite design is based, literally, on the Cross and Crescent symbols; this would lend it recognition. Both these factors are in accord with criteria 2.

The results indicate that the most frequent response to the Crosscent was "don't know" (studies 4 and 5). This suggests that any emergent connotations may not be necessarily religious, given the small proportion of responses of this nature it engendered. The composite design also avoids the problems of juxtaposing the individual Cross and Crescent emblems which the movement discourages, because, among other things, it tends to 'accentuate' the religious connotations of each emblem (Sommaruga, 1992: 2). Separate symbols place countries with almost equal Muslim and Christian populations such as Kazakhstan and Eritrea in an awkward position – using one or the other symbol would conceivably alienate a significant proportion of their populations (Bugnion, 2000: 27). In the absence of alternatives however, these countries are inclined to use the juxtaposed symbols. The International Federation of Red Cross and Red Crescent Societies uses the juxtaposed Cross and Crescent device as its logo. The Crosscent would offer a less awkward option to these countries and the International Federation, thus meeting criteria 4. Whether this schematic design is adequate to assuage countries and communities opposed to the use of either the Cross or the Crescent (such as Israel) is a matter of empirical enquiry.

The Crosscent design employed here was an initial proposal for the purpose of this investigation. It appears to merit further development and testing, given the results here and the circumstances under which symbols for the movement are sometimes used, for instance, in battlefields and natural or man-made disaster conditions. Thus, the aspects of conspicuity ('is there something there?') and discriminability ('what is it that is there?') (Adams & Montague, 1994: 207, 208) should be investigated if this design is to be taken further. Testing in countries with religious groups other than those featured in Tables 3.1 to 3.5 is also recommended.

In making these recommendations which have been published in the *Information Design Journal* (Murungi, McLaren, & Chen, 2002/2003), emphasis has been placed on results from the comprehension tests. This bias is based on the argument that open-ended tests have higher face and ecological validity than methods which provide respondents with alternative symbol meanings (Foster, 1994: 191; Wolff & Wogalter, 1998: 174) in the manner the attributes were employed here in the correspondence rating and comprehensibility judgment tests. Methodologies which provoke free responses reflect better the real-world situation where alternatives to a symbol's meaning would not be normally provided adjacent to the symbol.

6 Implications for theory and practice

6.1 Implications for theory

At one level of analysis (referent denotation), pictorial, schematic, and abstract graphical symbols appear to function in the same way, i.e., iconically and indexically. At another level of analysis (symbol interpretation), pictorial, schematic, and abstract graphical symbols appear to function in the same way, i.e., iconically and symbolically. (The lone schematic symbol appeared also to function indexically at the symbol interpretation level.) Thus, the semiosis of pictorial, schematic, and abstract graphical symbols is more similar than has been acknowledged previously in the graphical symbols research literature. This finding would constitute new knowledge. The outcome suggests also that Peirce's theories of iconicity, indexicality, and symbolicity are not congruent with the respective pictorial, schematic, and abstract modes of visual representation or visual communication. Further, the semiosis of graphical symbols appears to differ at the referent denotation and symbol interpretation levels (i.e., generally iconic and indexical in the former, and iconic and symbolic in the latter). This finding would constitute new knowledge. The outcome suggests also that even though iconic, indexical, and symbolic signification processes were evident at both levels, Peirce's theories are not a stable construct in the manner envisaged earlier (see Sections 2.3.2 and 2.3.3). Peirce had in fact conceived a much more complex arrangement than the one hypothesised here (cf. Cobley & Jansz, 1997; Sless, 1986). The results nonetheless affirm this complexity.

The perceptual and representational relationship between graphical symbols (the material aspect of a symbol) and referents (the mental concept that ought to be engendered by the symbol, thus facilitating an accurate reading of the visualised information) appears to be non-arbitrary, contrary to earlier semiotic thinking exemplified by Saussure's 'signifier-signified' dyad (cf. Cobley & Jansz, 1997).

6.2 Implications for practice

6.2.1 Comparative effectiveness

The quantity and variety of responses between symbols of pictorial, schematic, and abstract graphical forms were of an order to suggest that pictorial symbols were not functionally better than abstract or schematic symbols at representing and communicating information, an outcome that appears to validate our identical symbol semiosis findings (Section 6.1). Further, the correspondence between pictorial symbols and concrete attributes, and between schematic and abstract symbols and abstract attributes, suggests that symbol appropriateness "is in the eye of the beholden" pictorial, schematic, and abstract graphical form and respective concrete and abstract referent language. Thus, pictorial, schematic, and abstract symbols would be equally effective at representing (and presumably communicating) information as long as the concreteness or abstractness of the information was congruent with the graphical form of the symbol.

Paradoxically, this suggests that the design route that one would take when presented with information to visualise and a brief to achieve optimal convergence between message and viewer is less clear. On the one hand, if the decision were to be based on a choice between pictorial, schematic, or abstract symbols, these graphical modes of communication appear to function in the same manner. On the other hand, given concrete information to visualise, a pictorial outcome would seem more appropriate; given abstract information, schematic or abstract outcomes appear inevitable.

6.2.2 Symbol semiosis: models of application

The findings suggest that symbols of differing graphical forms function in broadly similar ways. Nonetheless, distinct symbol semiosis was discernible between symbols. Indeed, it was in this manner only that we could demonstrate that the

test symbols functioned in unique ways. Therefore, symbol semiosis, rather than graphical form, would appear to be a practical and ecologically valid, albeit complex, method for deciding the type of symbol one would use to communicate specific types of messages. The implications for practice are apparent.

In the safety symbol domain for example, where unequivocal communication of information is critical, one would want to leverage **iconic symbol semiosis**, irrespective of whether the graphical form of the symbol was pictorial, schematic, or abstract. The iconic symbol semiosis model relies on a visually analogous symbol-referent relationship. This would reduce conceivably occasion for incomprehension and misunderstanding. The absence of 'don't know' responses among pictorial symbols in studies 4 and 5 provides evidence to support this claim.

Results here suggest that **symbolic symbol semiosis** would serve equally well in the safety symbol domain; this is exemplified by the frequency of 'warning/danger' responses to the abstract Heart and Crystal symbols in study 5 (see Table 4.4).

Leveraging **indexical symbol semiosis** would be a useful tool in the corporate identity field, for instance. Changes in vision, strategy, ownership, and fashion dictate the pace and scope of re-branding, hence the indexical symbol semiosis model relies on the amenability of this class of symbols. Our analysis suggests indexical symbols are unencumbered by the necessity of a visual or conventionalised analogue between symbol and referent which tends to fixate the symbol-referent relationship; new readings and meanings identifiable with the corporate entity in its evolving manifestations are thus remote. The signification of unity by the Crosscent in study 4 (as distinct from responses to the individual Cross and Crescent symbols) demonstrates indexical symbol semiosis.

7 Recommendations for future work

7.1 Symbol testing

One of the limitations of the current study was the number of symbols tested. The outcomes would be more generaliseable if the number of symbols in each category, i.e., pictorial, schematic, and abstract, were larger. This shortcoming is partly due to the lack of pictorial, schematic, and abstract symbols which represent the same referent. For example, in the road traffic signing domain, there are a good number of symbols that would fall within the three categories, but finding a pictorial *and* schematic *and* abstract symbol which represents, for instance, "No entry" or "Pedestrian crossing" may not be fruitful. Indeed, in previous research by the author (Murungi, 1996), new designs were created to fill the gaps where test material of, say, a pictorial nature were abundant but none of an abstract form were available. This, however, introduced the problem of testing real and fictional signs in a well-known context. Nonetheless, there are certain domains where pictorial, schematic, and abstract symbols are deployed to represent similar functions, e.g., by Internet Service Providers. Adopting the methodology of the current research, symbols from these domains would be appropriate vehicles for testing the hypotheses postulated here, thus validating the generalisations.

Another limitation of the current study was the number of countries within which the tests were carried out. ISO 9186: 2001 recommends comprehensibility testing in at least two countries and comprehension testing in at least three countries. The former was carried out only in Kenya and the latter in Kenya and the UK. This decision was made because of the financial costs involved and the demands of time and fairly large sample sizes (minimum of 50 participants per referent and per test). The correspondence rating tests, the non-ISO component in the investigation, were carried out in Kenya and the UK, increasing the costs further. Undoubtedly, extending the study to countries with different respondent characteristics from

those featured in Tables 3.1 to 3.5 would be beneficial especially with regard to the suitability of the test symbols in relation to the International Red Cross and Red Crescent Movement.

7.2 Proposed modification to format of ISO 9186: 2001

The use of an A4, single-sheet, self-completed, black-and-white questionnaire for each study improved the efficiency of production, recruitment of participants, questionnaire administration, completion, and retrieval. For instance, more than 250 people participated in the comprehensibility judgement and comprehension tests carried out over two months in five different locations in Kenya. There appears to be no reason why this format cannot be adopted – the production of booklets for the comprehension test as currently stated in ISO 9186: 2001 seems unnecessarily complex and costly. The A4 format is easily adaptable also as an internet-based data-collection instrument.

7.3 Corroborating the findings

The way forward with regard to the development of the symbol proposals employed here for the International Red Cross and Red Crescent Movement has been signposted in the discussion chapter (Section 5.3). Suffice it to say that a decision on the official proposal, the Crystal, is imminent after the 28th International Conference of the Red Cross and Red Crescent to be held during December 2003. The International Committee of the Red Cross has been made aware of the findings of this study through a letter, email message, and journal article (Murungi et al., 2002/2003). Corroborating in a wider context the evidence here that the Crystal presents some challenges, while demonstrating the solution may lie elsewhere, may prompt reconsideration of the Crystal proposal. The advantages of doing this go beyond the needs of the movement.

Empirical testing provides a means by which we uncover the strengths and weakness of different symbol typologies and designs, or validate and extend the utility of theories and test methods. For instance, the demonstration here of visual-verbal resonance between pictorial symbols and concrete referents and between abstract and schematic symbols and abstract referents presents a testable proposition, approached from the opposite direction which this study took. It was suggested in Section 6.2.1 that the route from abstract information to abstract or schematic symbol appears inevitable, pre-determined by the abstractness of the information to be visualised. If validated, this outcome would reduce trial-and-error methodologies. However, the question of whether the interpretation of symbols can, indeed, be constrained by pictorial, schematic, or abstract graphical forms remains largely unanswered; more research would provide valuable insights.

7.4 Interdisciplinary research

The irreversible trend towards a visual and information age demands informed knowledge of the media of visual communication and interactivity, the processes of information visualisation and graphical signification, and of user perceptions and cognition. Further, the suggestion made here regarding a shift in focus in symbol research from the graphical forms themselves to symbol semiosis calls for interdisciplinary and methodical interrogation if the outcomes of this approach are to be applied usefully. The implications for theory and practice enumerated in the previous chapter suggest that applications would be practical and profitable. It is in recommending change in the object of study towards symbol semiosis and in signposting practical applications occasioned by this reconsideration of the locus of emphasis in symbol research that a contribution, hopefully, has been made to the emergent subject of **vis**ual **comm**unication and semiot**ics** research, **Viscommics.**[7]

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[7] Moriarty (1994) proposed naming the new field 'Visemics'. However, the term does not capture adequately the key area served by the 'marriage' between visual communication and semiotics, i.e., communication; hence Viscommics.

APPENDICES

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UNITED KINGDOM

Corr/ke/08.02/ **Appendix I**

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UK

Thank you for sparing your valuable time to participate in this study, which seeks to identify the most suitable graphic symbol to represent an international organisation.

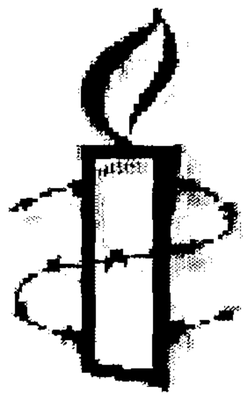
Please examine each symbol overleaf and indicate the idea or object (from 1 to 4) that you think the symbol represents. You normally would expect to see the symbol on aircraft, buildings, clothing, documents, flags, packaging, and vehicles.

You can indicate more than one answer for each symbol.

This is an example:

The idea or object that I think the symbol represents…

1 / Humanitarianism **2 / Protection** **3 / Neutrality** **4 / Universality**



e.g.

1 2 3 4

Please turn over.

Personal data:

Age 15-30 ☐ 31-50 ☐ 51+ ☐ Gender Female ☐ Male ☐

Education level
(e.g. secondary, technical, university)

Occupation
(e.g. factory worker, nurse, student)

Ethnicity
(How you describe yourself e.g. Black-African, Indian)

Religion

Have you any physical disability? NO
If YES please specify nature:

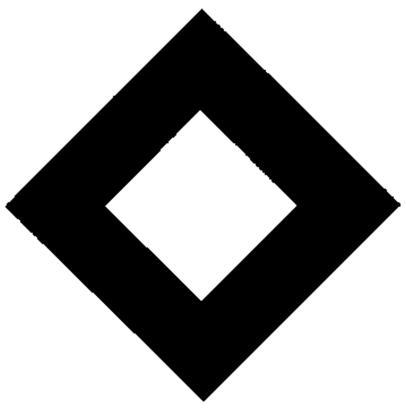
Country of permanent residence

The idea or object that I think each symbol represents…

1 / Humanitarianism **2 / Protection** **3 / Neutrality** **4 / Universality**

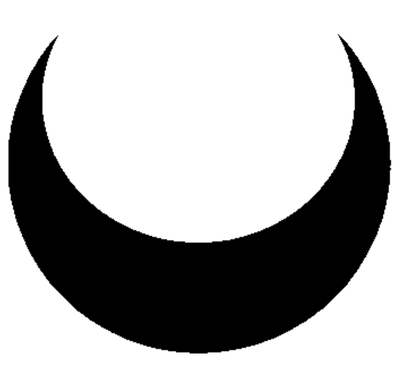
A

1 2 3 4



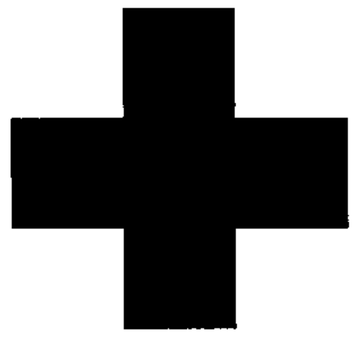
F

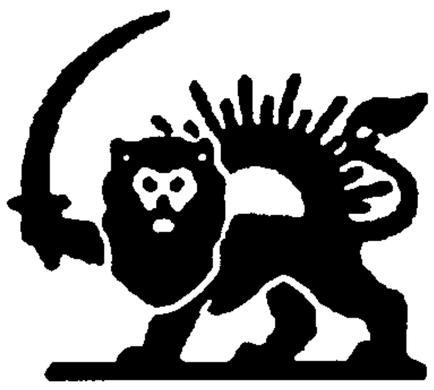
1 2 3 4



B

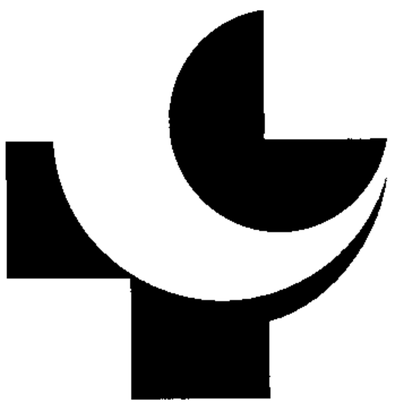
1 2 3 4





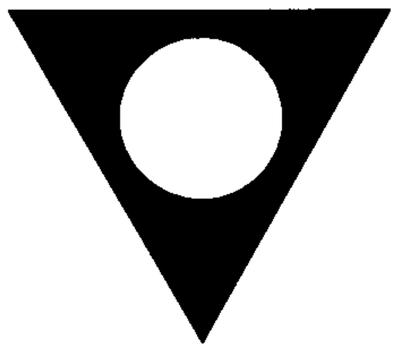
E

1 2 3 4



D

1 2 3 4



C

1 2 3 4

Please complete the personal data section overleaf. Thank you once again for your time. *Ahsante!*

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UK

Thank you for sparing your valuable time to participate in this study, which seeks to identify the most suitable graphic symbol to represent an international organisation.

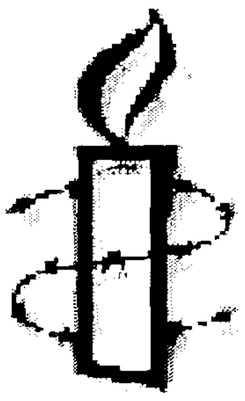
Please examine each symbol overleaf and indicate the idea or object that you think the symbol represents. You normally would expect to see the symbol on aircraft, buildings, clothing, documents, flags, packaging, and vehicles.

You can indicate more than one answer, from 1 to 4, for each symbol. Circle 5 if you do not think the symbol represents any of the four choices given.

This is an example:

The idea or object that I think the symbol represents…

1 / Humanitarianism 2 / Protection 3 / Neutrality 4 / Universality 5 / None of these



e.g.

(1) (2) 3 4 5

Please turn over.

Personal data:

Age 15-30 ☐ 31-50 ☐ 51+ ☐ Gender Female ☐ Male ☐

Education level *(e.g. secondary, technical, university)*

Occupation *(e.g. factory worker, nurse, student)*

Ethnicity *(How you describe yourself e.g. Black-African, Indian)*

Religion

Have you any physical disability? NO
If YES please specify nature:

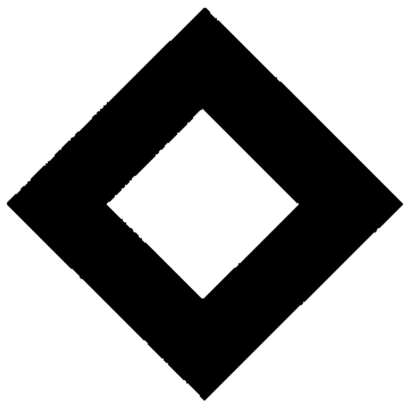
Country of permanent residence

The idea or object that I think each symbol represents…

1 / Humanitarianism **2 / Protection** **3 / Neutrality** **4 / Universality** **5 / None of these**

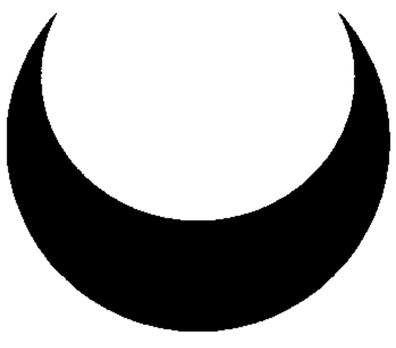
A

1 2 3 4 5



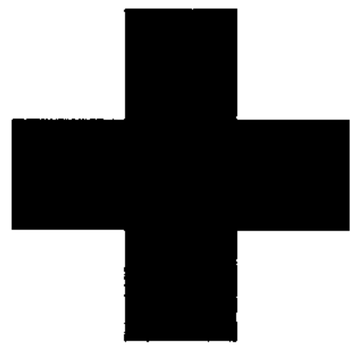
F

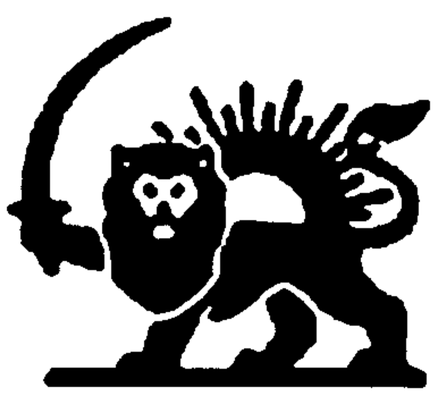
1 2 3 4 5



B

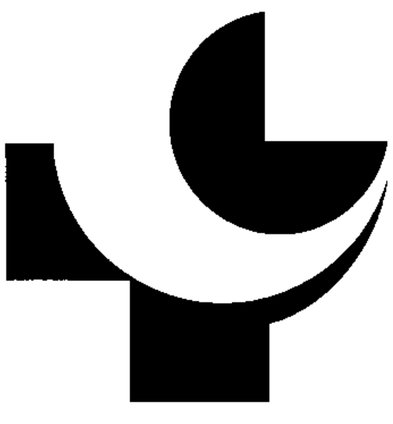
1 2 3 4 5





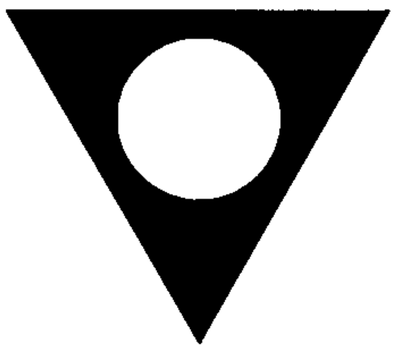
E

1 2 3 4 5



D

1 2 3 4 5



C

1 2 3 4 5

Please complete the personal data section overleaf. Thank you once again for your time.

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Thank you for sparing your valuable time to participate in this study, which seeks to identify the most suitable graphic symbol to represent an international organisation.

Please read carefully the information below:

The idea or object that the graphic symbol is intended to represent:
The idea of "humanitarianism" i.e. offering assistance voluntarily and without discrimination.

The function of the symbol:
To identify personnel, equipment and facilities of those that come to the aid of victims of war and internal conflict, disease and natural disasters.
To communicate their role as being humanitarian.

Where you normally would expect to see the symbol:
On aircraft, buildings, clothing, documents, flags, packaging, and vehicles.

Bearing in mind the information above, examine ALL the symbols overleaf:

Personal data:

Age | 15-30 | | 31-50 | | 51+ | | Gender | Female | | Male | |

Education level
(e.g. secondary, technical, university)

Occupation
(e.g. factory worker, nurse, student)

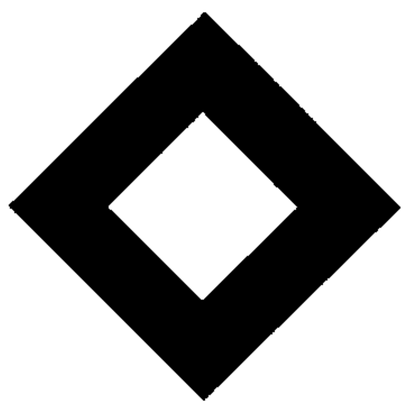
Ethnicity
(How you describe yourself e.g. Black-African, Indian)

Religion

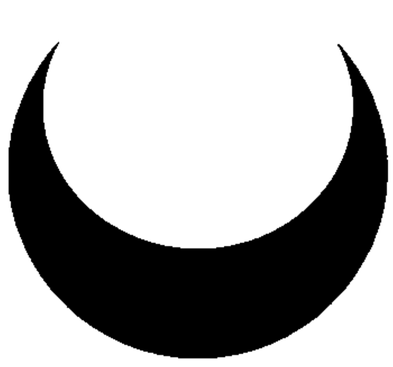
Have you any physical disability? NO
If YES please specify nature:

Country of permanent residence

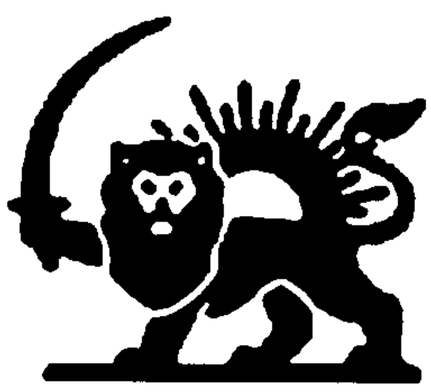
A

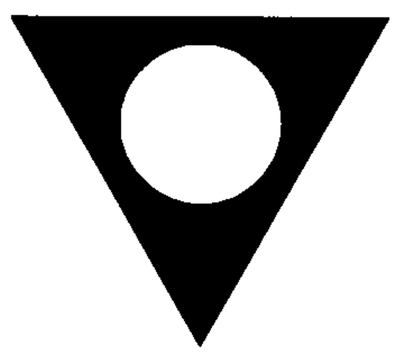


F

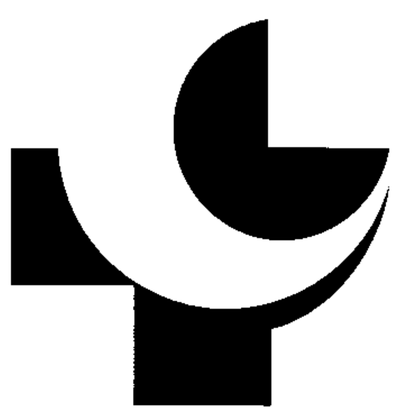


B





E



C

D

Each symbol is supposed to mean **humanitarianism**. Write the percentage of the population that you expect would understand this meaning in the box next to each symbol.

(0% for NOONE would understand, 100% for EVERYONE would understand, and so on)

Please complete the personal data section overleaf. Thank you once again for your time. *Ahsante!*

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Judg/Pro/ke/05-08.02/**Appendix IV**

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Thank you for sparing your valuable time to participate in this study, which seeks to identify the most suitable graphic symbol to represent an international organisation.

Please read carefully the information below:

The idea or object that the graphic symbol is intended to represent:
The idea of "protection" i.e. sheltering the vulnerable from attack, ill treatment, or ill health.

The function of the symbol:
To identify personnel, equipment and facilities of those that come to the aid of victims of war and internal conflict, disease and natural disasters.
To communicate their role as being protective.

Where you normally would expect to see the symbol:
On aircraft, buildings, clothing, documents, flags, packaging, and vehicles.

Bearing in mind the information above, examine ALL the symbols overleaf:

Personal data:

Age | 15-30 | | 31-50 | | 51+ | | Gender | Female | | Male | |

Education level
(e.g. secondary, technical, university)

Occupation
(e.g. factory worker, nurse, student)

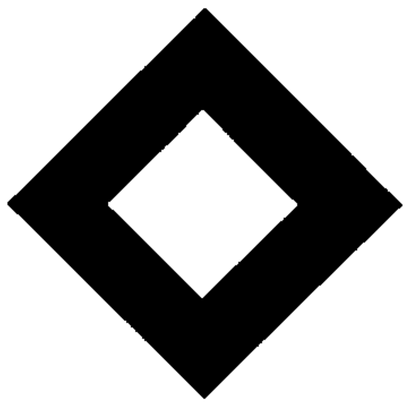
Ethnicity
(How you describe yourself e.g. Black-African, Indian)

Religion

Have you any physical disability? NO
If YES please specify nature:

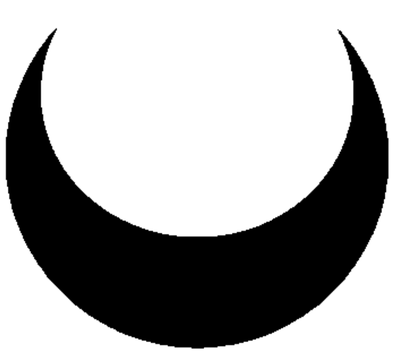
Country of permanent residence

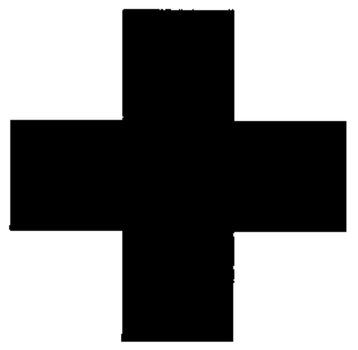
A

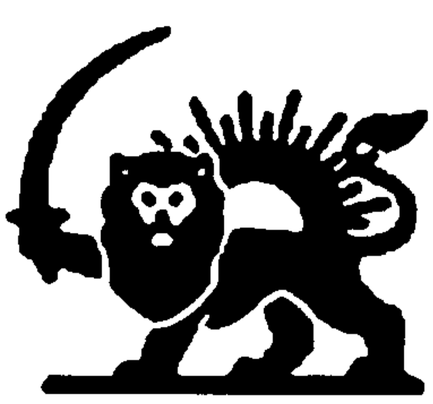


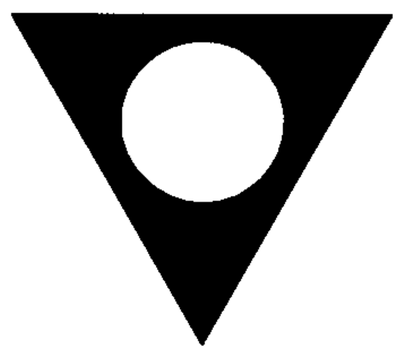
F

B

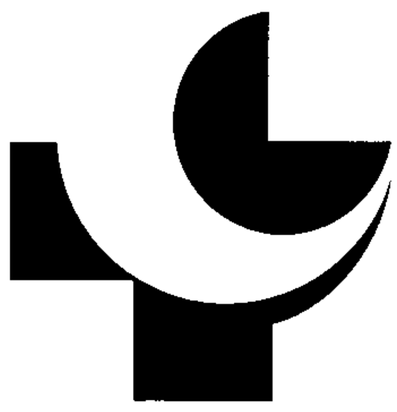








E



C

D

Each symbol is supposed to mean **protection**. Write the percentage of the population that you expect would understand this meaning in the box next to each symbol.

(0% for NOONE would understand, 100% for EVERYONE would understand, and so on)

Please complete the personal data section overleaf. Thank you once again for your time. *Ahsante!*

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UK

Thank you for sparing your valuable time to participate in this study, which seeks to identify the most suitable graphic symbol to represent an international organisation.

Please read carefully the information below:

The idea or object that the graphic symbol is intended to represent:
The idea of "neutrality" i.e. being impartial or unbiased.

The function of the symbol:
To identify personnel, equipment and facilities of those that come to the aid of victims of war and internal conflict, disease and natural disasters.
To communicate their role as neutral.

Where you normally would expect to see the symbol:
On aircraft, buildings, clothing, documents, flags, packaging, and vehicles.

Bearing in mind the information above, examine ALL the symbols overleaf:

Personal data:

Age | 15-30 | | 31-50 | | 51+ | | Gender | Female | | Male | |

Education level
(e.g. secondary, technical, university)

Occupation
(e.g. factory worker, nurse, student)

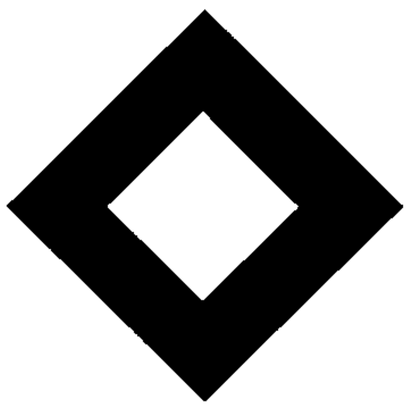
Ethnicity
(How you describe yourself e.g. Black-African, Indian)

Religion

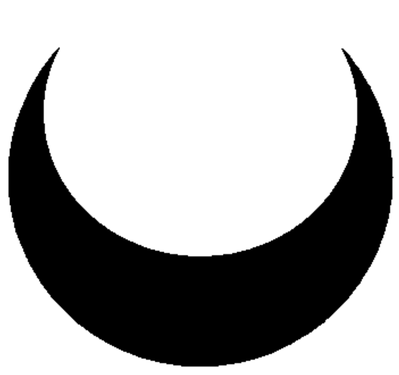
Have you any physical disability? NO
If YES please specify nature:

Country of permanent residence

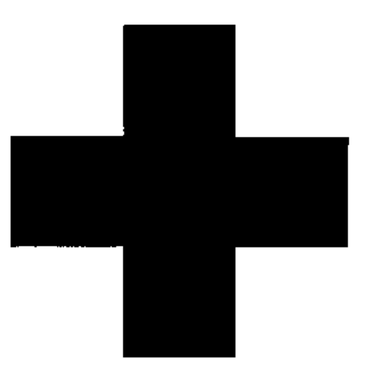
A

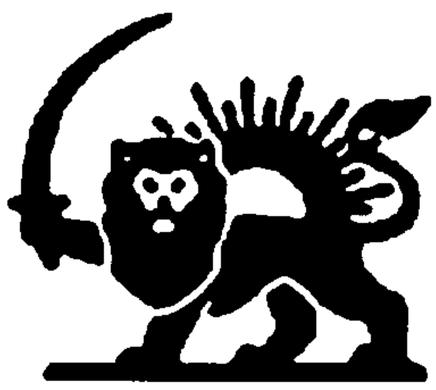


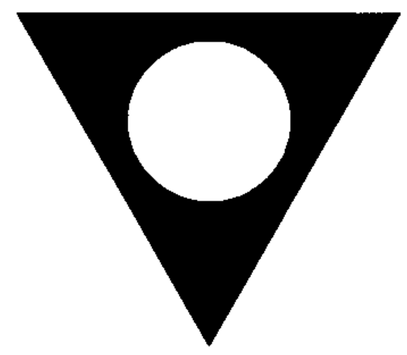
F



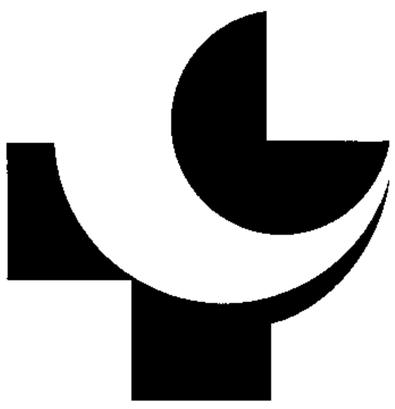
B







E



C

D

Each symbol is supposed to mean **neutrality**. Write the percentage of the population that you expect would understand this meaning in the box next to each symbol.

(0% for NOONE would understand, 100% for EVERYONE would understand, and so on)

Please complete the personal data section overleaf. Thank you once again for your time. *Ahsante!*

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Judg/Uni/ke/05-08.02/**Appendix VI**

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UK

Thank you for sparing your valuable time to participate in this study, which seeks to identify the most suitable graphic symbol to represent an international organisation.

Please read carefully the information below:

The idea or object that the graphic symbol is intended to represent:
The idea of "universality" i.e. reflecting a wider concern and global response to human suffering.

The function of the symbol:
To identify personnel, equipment and facilities of those that come to the aid of victims of war and internal conflict, disease and natural disasters.
To communicate their role as being universal.

Where you normally would expect to see the symbol:
On aircraft, buildings, clothing, documents, flags, packaging, and vehicles.

Bearing in mind the information above, examine ALL the symbols overleaf:

Personal data:

Age | 15-30 | | 31-50 | | 51+ | | Gender | Female | | Male | |

Education level
(e.g. secondary, technical, university)

Occupation
(e.g. factory worker, nurse, student)

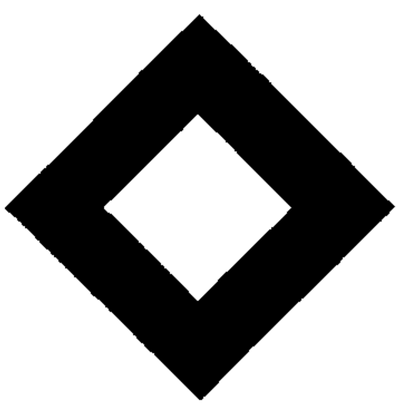
Ethnicity
(How you describe yourself e.g. Black-African, Indian)

Religion

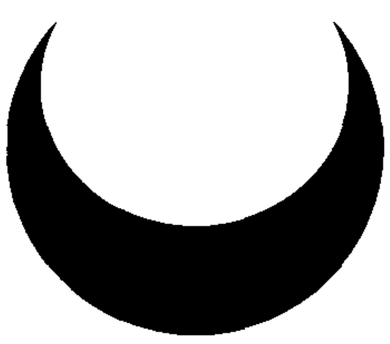
Have you any physical disability? NO
If YES please specify nature:

Country of permanent residence

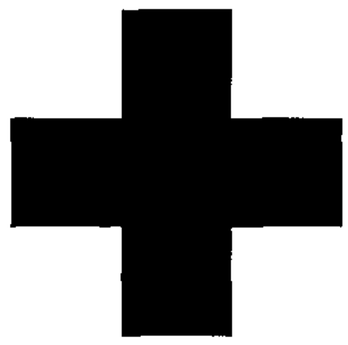
A

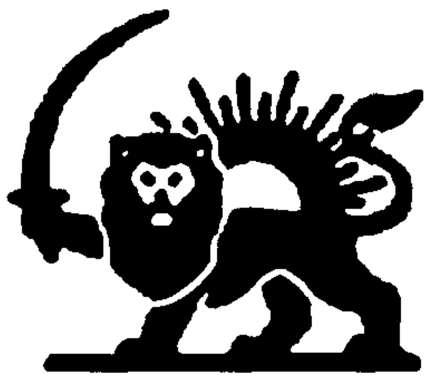


F

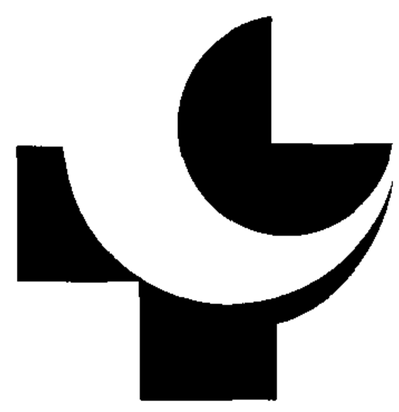


B





E



C

D

Each symbol is supposed to mean **universality**. Write the percentage of the population that you expect would understand this meaning in the box next to each symbol.

(0% for NOONE would understand, 100% for EVERYONE would understand, and so on)

Please complete the personal data section overleaf. Thank you once again for your time. *Ahsante!*

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Comp/ke/05-08.02/**Appendix VII**

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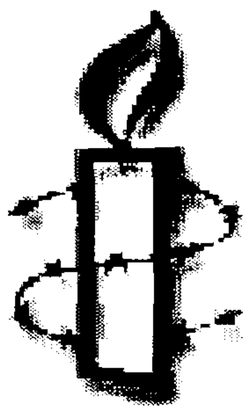
Thank you for sparing your valuable time to participate in this study, which seeks to identify the most suitable graphic symbol to represent an international organisation.

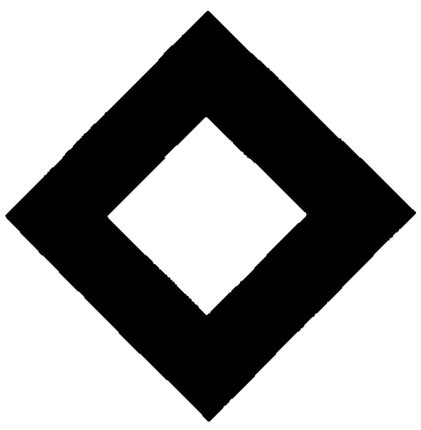
Please examine each symbol carefully and write down **what you think the symbol means**.
You normally would expect to see the symbol on buildings, clothing, documents, flags, packaging, and vehicles.

Write down "Don't know" if you cannot assign a meaning to the symbol.

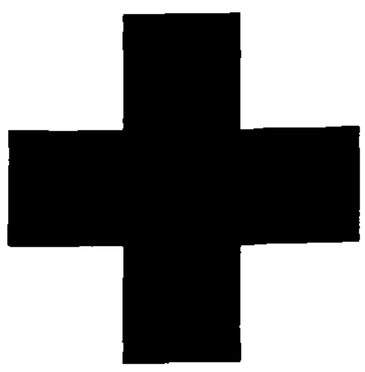
This is an example:



I think this symbol means *Freedom / Escape / Hope / Human rights*

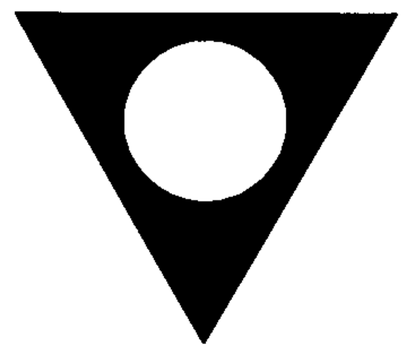


I think this symbol means_____A

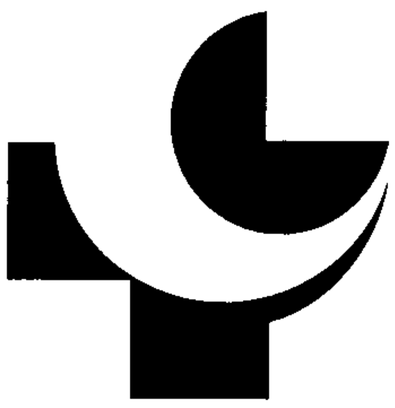


I think this symbol means_____B

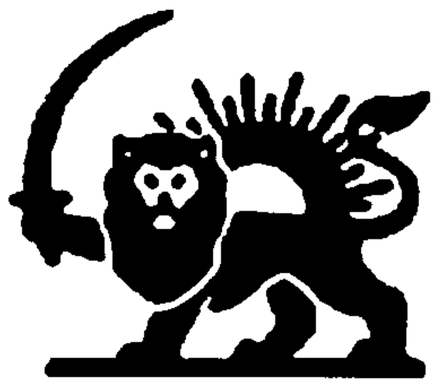
Please turn over



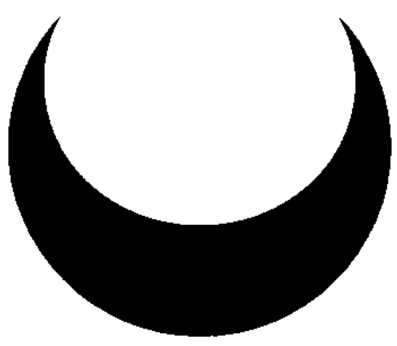
I think this symbol means_____C



I think this symbol means_____D



I think this symbol means_____E



I think this symbol means_____F

Please complete the personal data section below. Thank you once again for your time. *Ahsante!*

Age | 15-30 | | 31-50 | | 51+ | | Gender | Female | | Male | |

Education level *(e.g. secondary, technical, university)*	Occupation *(e.g. factory worker, nurse, student)*
Ethnicity *(How you describe yourself e.g. Black-African, Indian)*	Religion
Have you any physical disability? NO If YES please specify nature:	Country of permanent residence

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Comp/uk/10.03/**Appendix VIII**

Havi Murungi
Graduate Centre
Faculty of Art and Design
Fletcher Building
The Gateway
Leicester
LE1 9BH
UK

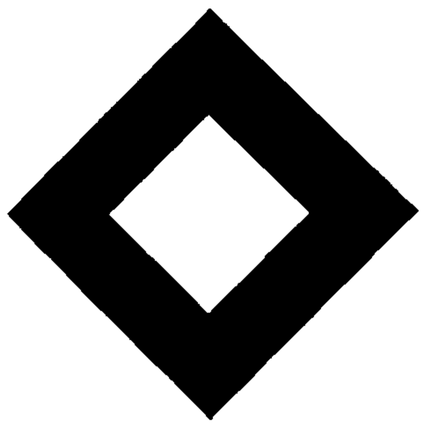
Thank you for sparing your valuable time to participate in this study, which seeks to identify the most suitable graphic symbol to represent an international organisation.

Please examine each symbol carefully and write down **what you think the symbol means**.
You normally would expect to see the symbol on buildings, clothing, documents, flags, packaging, and vehicles.

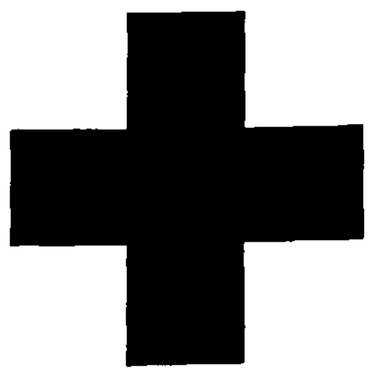
Write down "Don't know" if you cannot assign a meaning to the symbol.

This is an example:

I think this symbol means *Freedom / Escape / Hope / Human rights*

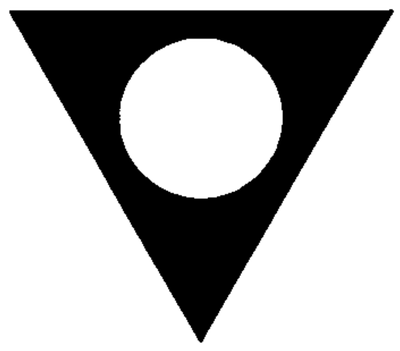


I think this symbol means_____ A

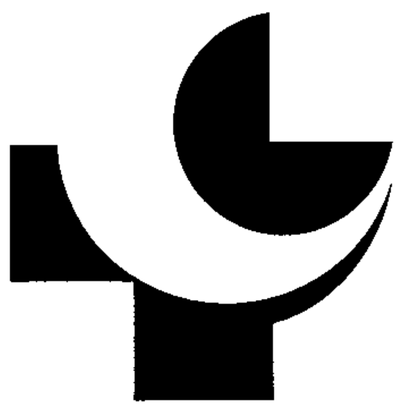


I think this symbol means_____ B

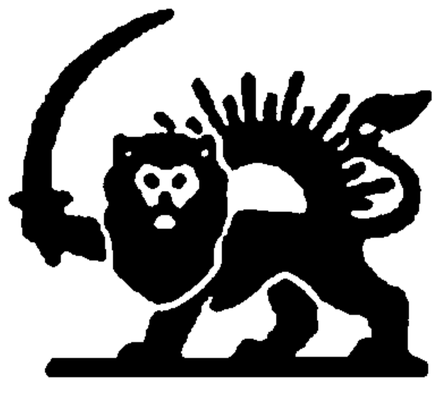
Please turn over



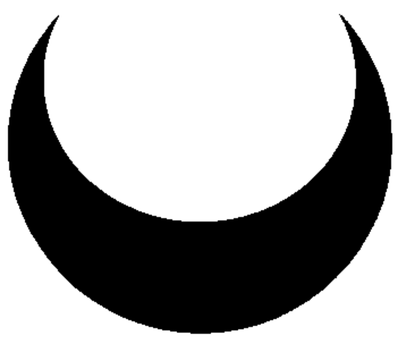
I think this symbol means_____C



I think this symbol means_____D



I think this symbol means_____E



I think this symbol means_____F

Please complete the personal data section below. Thank you once again for your time.

Age	15-30		31-50		51+		Gender	Female		Male	

Education level *(e.g. secondary, technical, university)*	Occupation *(e.g. factory worker, nurse, student)*
Ethnicity *(How you describe yourself e.g. Black-African, Indian)*	Religion
Have you any physical disability? NO If YES please specify nature:	Country of permanent residence

Appendix IX: SPSS output (studies 1 and 2 crosstabs and Chi-Square tests)

rosstabs KENYA correspondence rating test

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Referent * Symbol	534	100.0%	0	.0%	534	100.0%

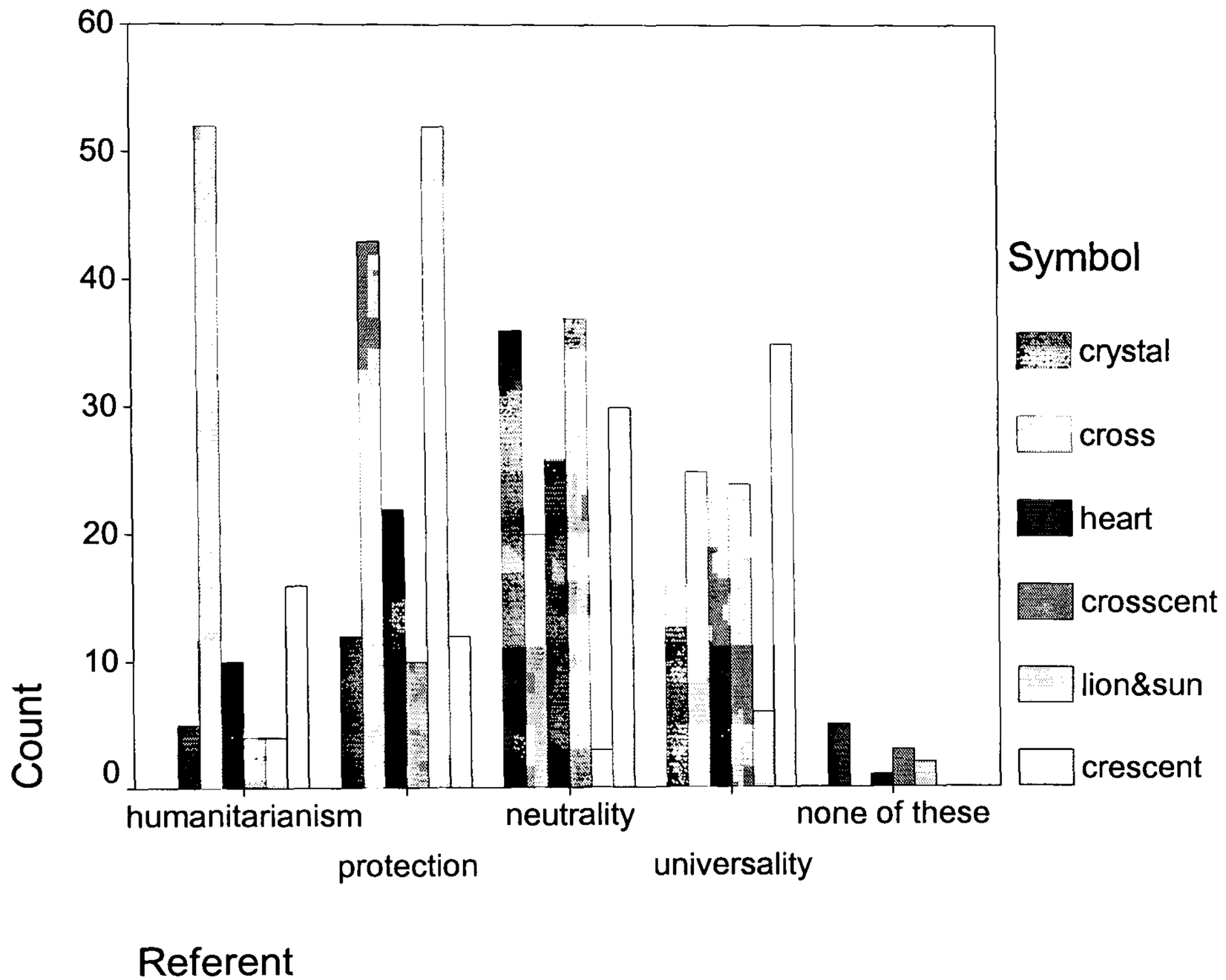
Referent * Symbol Crosstabulation

			Symbol						Total
			crystal	cross	heart	crosscent	lion&sun	crescent	
Referent	humanitarianism	Count	5	52	10	4	4	16	91
		Expected Count	12.6	23.9	14.0	13.3	11.4	15.8	91.0
		% within Symbol	6.8%	37.1%	12.2%	5.1%	6.0%	17.2%	17.0%
	protection	Count	12	43	22	10	52	12	151
		Expected Count	20.9	39.6	23.2	22.1	18.9	26.3	151.0
		% within Symbol	16.2%	30.7%	26.8%	12.8%	77.6%	12.9%	28.3%
	neutrality	Count	36	20	26	37	3	30	152
		Expected Count	21.1	39.9	23.3	22.2	19.1	26.5	152.0
		% within Symbol	48.6%	14.3%	31.7%	47.4%	4.5%	32.3%	28.5%
	universality	Count	16	25	23	24	6	35	129
		Expected Count	17.9	33.8	19.8	18.8	16.2	22.5	129.0
		% within Symbol	21.6%	17.9%	28.0%	30.8%	9.0%	37.6%	24.2%
	none of these	Count	5	0	1	3	2	0	11
		Expected Count	1.5	2.9	1.7	1.6	1.4	1.9	11.0
		% within Symbol	6.8%	.0%	1.2%	3.8%	3.0%	.0%	2.1%
Total		Count	74	140	82	78	67	93	534
		Expected Count	74.0	140.0	82.0	78.0	67.0	93.0	534.0
		% within Symbol	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	203.405[a]	20	.000
Likelihood Ratio	195.040	20	.000
Linear-by-Linear Association	2.568	1	.109
N of Valid Cases	534		

a. 6 cells (20.0%) have expected count less than 5. The minimum expected count is 1.38.



rosstabs UK correspondence rating test

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Referent * Symbol	427	100.0%	0	.0%	427	100.0%

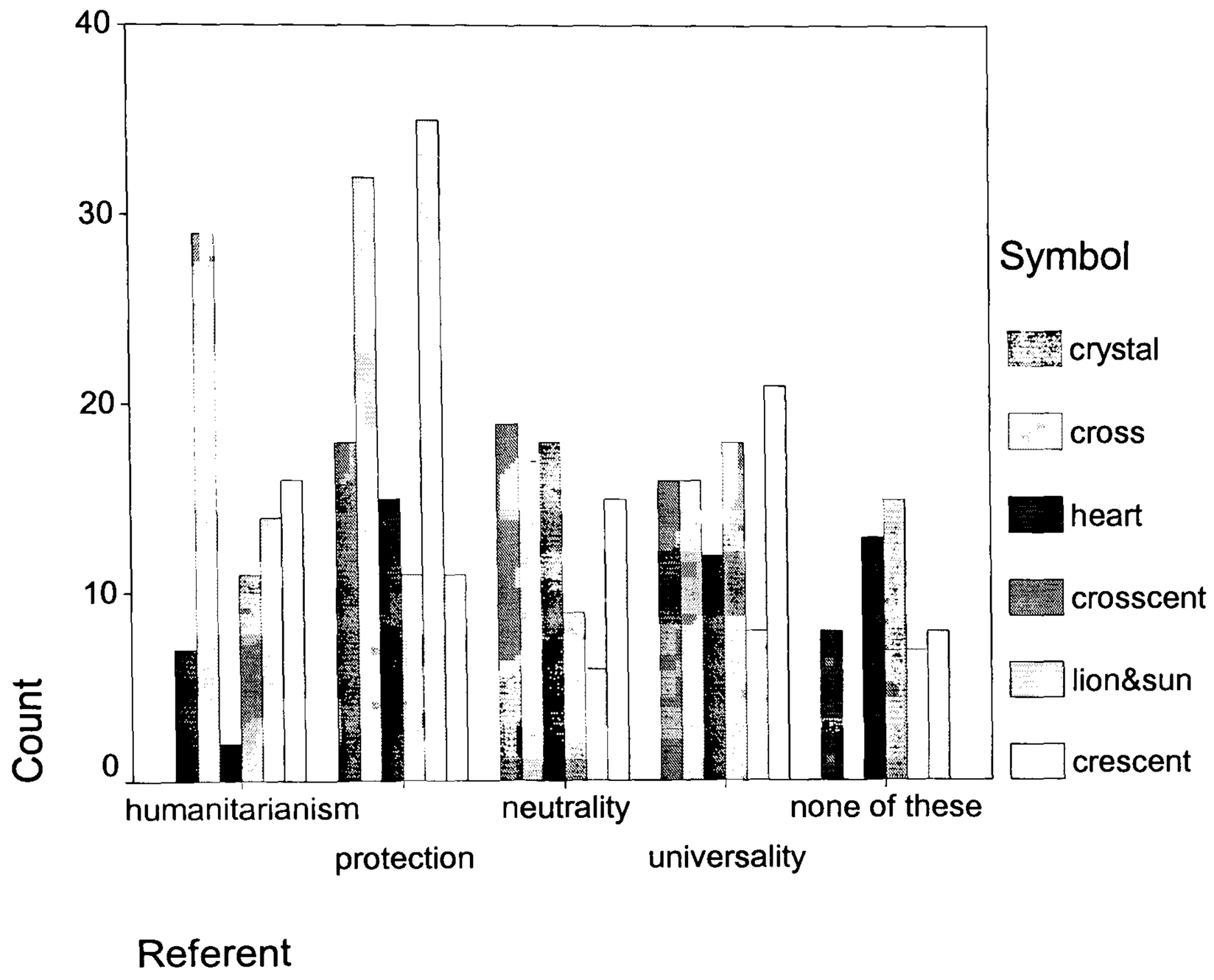
Referent * Symbol Crosstabulation

			Symbol						Total
			crystal	cross	heart	crosscent	lion&sun	crescent	
Referent	humanitarianism	Count	7	29	2	11	14	16	79
		Expected Count	12.6	17.4	11.1	11.8	13.0	13.1	79.0
		% within Symbol	10.3%	30.9%	3.3%	17.2%	20.0%	22.5%	18.5%
	protection	Count	18	32	15	11	35	11	122
		Expected Count	19.4	26.9	17.1	18.3	20.0	20.3	122.0
		% within Symbol	26.5%	34.0%	25.0%	17.2%	50.0%	15.5%	28.6%
	neutrality	Count	19	17	18	9	6	15	84
		Expected Count	13.4	18.5	11.8	12.6	13.8	14.0	84.0
		% within Symbol	27.9%	18.1%	30.0%	14.1%	8.6%	21.1%	19.7%
	universality	Count	16	16	12	18	8	21	91
		Expected Count	14.5	20.0	12.8	13.6	14.9	15.1	91.0
		% within Symbol	23.5%	17.0%	20.0%	28.1%	11.4%	29.6%	21.3%
	none of these	Count	8	0	13	15	7	8	51
		Expected Count	8.1	11.2	7.2	7.6	8.4	8.5	51.0
		% within Symbol	11.8%	.0%	21.7%	23.4%	10.0%	11.3%	11.9%
Total		Count	68	94	60	64	70	71	427
		Expected Count	68.0	94.0	60.0	64.0	70.0	71.0	427.0
		% within Symbol	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	80.639[a]	20	.000
Likelihood Ratio	92.528	20	.000
Linear-by-Linear Association	.345	1	.557
N of Valid Cases	427		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.17.



Appendix X: SPSS output (study 3 GLM repeated measures ANOVA)

General Linear Model

Within-Subjects Factors

Measure: MEASURE_1

SYMBOLS	Dependent Variable
1	Crystal
2	Cross
3	Heart
4	Crosscent
5	Lion and Sun
6	Crescent

Between-Subjects Factors

		Value Label	N
Attributes	1	humanitarianism	57
	2	protection	60
	3	neutrality	57
	4	universality	59

Descriptive Statistics

	Attributes	Mean	Std. Deviation	N
crystal	humanitarianism	30.53	25.00	57
	protection	27.93	25.66	60
	neutrality	35.42	26.86	57
	universality	36.36	24.40	59
	Total	32.53	25.56	233
cross	humanitarianism	81.14	22.98	57
	protection	78.05	21.08	60
	neutrality	77.00	24.79	57
	universality	78.02	25.55	59
	Total	78.54	23.54	233
heart	humanitarianism	39.77	29.25	57
	protection	33.38	21.52	60
	neutrality	36.88	26.11	57
	universality	39.80	24.86	59
	Total	37.42	25.50	233
crosscent	humanitarianism	34.54	26.79	57
	protection	31.48	26.07	60
	neutrality	35.89	27.33	57
	universality	34.20	26.03	59
	Total	34.00	26.43	233
lion&sun	humanitarianism	25.14	22.66	57
	protection	46.70	31.91	60
	neutrality	36.53	28.45	57
	universality	31.69	23.80	59
	Total	35.14	27.97	233
crescent	humanitarianism	50.46	27.14	57
	protection	49.32	23.18	60
	neutrality	56.11	29.08	57
	universality	53.51	26.74	59
	Total	52.32	26.54	233

Mauchly's Test of Sphericity[b]

Measure: MEASURE_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[a]		
					Greenhouse -Geisser	Huynh-Feldt	Lower-bound
SYMBOLS	.739	68.793	14	.000	.886	.917	.200

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

b.
Design: Intercept+ATTRIBUT
Within Subjects Design: SYMBOLS

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
SYMBOLS	Sphericity Assumed	375263.162	5	75052.632	134.437	.000
	Greenhouse-Geisser	375263.162	4.428	84752.780	134.437	.000
	Huynh-Feldt	375263.162	4.585	81845.893	134.437	.000
	Lower-bound	375263.162	1.000	375263.162	134.437	.000
SYMBOLS * ATTRIBUT	Sphericity Assumed	20322.265	15	1354.818	2.427	.002
	Greenhouse-Geisser	20322.265	13.283	1529.921	2.427	.003
	Huynh-Feldt	20322.265	13.755	1477.447	2.427	.003
	Lower-bound	20322.265	3.000	6774.088	2.427	.066
Error(SYMBOLS)	Sphericity Assumed	639221.564	1145	558.272		
	Greenhouse-Geisser	639221.564	1013.952	630.426		
	Huynh-Feldt	639221.564	1049.964	608.803		
	Lower-bound	639221.564	229.000	2791.361		

Tests of Between-Subjects Effects

Measure: MEASURE_1
Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	2828744.035	1	2828744.035	2338.548	.000
ATTRIBUT	1479.167	3	493.056	.408	.748
Error	277001.913	229	1209.615		

stimated Marginal Means

. Attributes

Estimates

Measure: MEASURE_1

Attributes	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
humanitarianism	43.596	1.881	39.891	47.302
protection	44.478	1.833	40.866	48.090
neutrality	46.304	1.881	42.598	50.010
universality	45.596	1.849	41.954	49.238

2. SYMBOLS

Estimates

Measure: MEASURE_1

SYMBOLS	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Crystal	32.559	1.670	29.268	35.850
Cross	78.552	1.550	75.499	81.605
Heart	37.457	1.673	34.161	40.754
Crosscent	34.031	1.740	30.603	37.459
Lion and Sun	35.015	1.769	31.529	38.502
Crescent	52.347	1.742	48.915	55.778

Pairwise Comparisons

Measure: MEASURE_1

(I) SYMBOLS	(J) SYMBOLS	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
					Lower Bound	Upper Bound
1	2	-45.993*	2.270	.000	-52.725	-39.260
	3	-4.898	1.761	.088	-10.122	.326
	4	-1.472	1.970	1.000	-7.316	4.372
	5	-2.456	2.202	1.000	-8.987	4.075
	6	-19.787*	2.205	.000	-26.328	-13.247
2	1	45.993*	2.270	.000	39.260	52.725
	3	41.095*	2.268	.000	34.367	47.822
	4	44.520*	2.417	.000	37.352	51.689
	5	43.536*	2.431	.000	36.325	50.748
	6	26.205*	1.933	.000	20.471	31.940
3	1	4.898	1.761	.088	-.326	10.122
	2	-41.095*	2.268	.000	-47.822	-34.367
	4	3.426	2.040	1.000	-2.626	9.478
	5	2.442	2.170	1.000	-3.996	8.879
	6	-14.889*	2.352	.000	-21.866	-7.913
4	1	1.472	1.970	1.000	-4.372	7.316
	2	-44.520*	2.417	.000	-51.689	-37.352
	3	-3.426	2.040	1.000	-9.478	2.626
	5	-.984	2.080	1.000	-7.155	5.187
	6	-18.315*	2.361	.000	-25.320	-11.310
5	1	2.456	2.202	1.000	-4.075	8.987
	2	-43.536*	2.431	.000	-50.748	-36.325
	3	-2.442	2.170	1.000	-8.879	3.996
	4	.984	2.080	1.000	-5.187	7.155
	6	-17.331*	2.266	.000	-24.052	-10.611

Based on estimated marginal means

Pairwise Comparisons

Measure: MEASURE_1

(I) SYMBOLS	(J) SYMBOLS	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
					Lower Bound	Upper Bound
6	1	19.787*	2.205	.000	13.247	26.328
	2	-26.205*	1.933	.000	-31.940	-20.471
	3	14.889*	2.352	.000	7.913	21.866
	4	18.315*	2.361	.000	11.310	25.320
	5	17.331*	2.266	.000	10.611	24.052

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Bonferroni.

ost Hoc Tests

lomogeneous Subsets

MEASURE_1

Tukey HSD[a,b,c]

Attributes	N	Subset 1
humanitarianism	57	43.60
protection	60	44.48
universality	59	45.60
neutrality	57	46.30
Sig.		.732

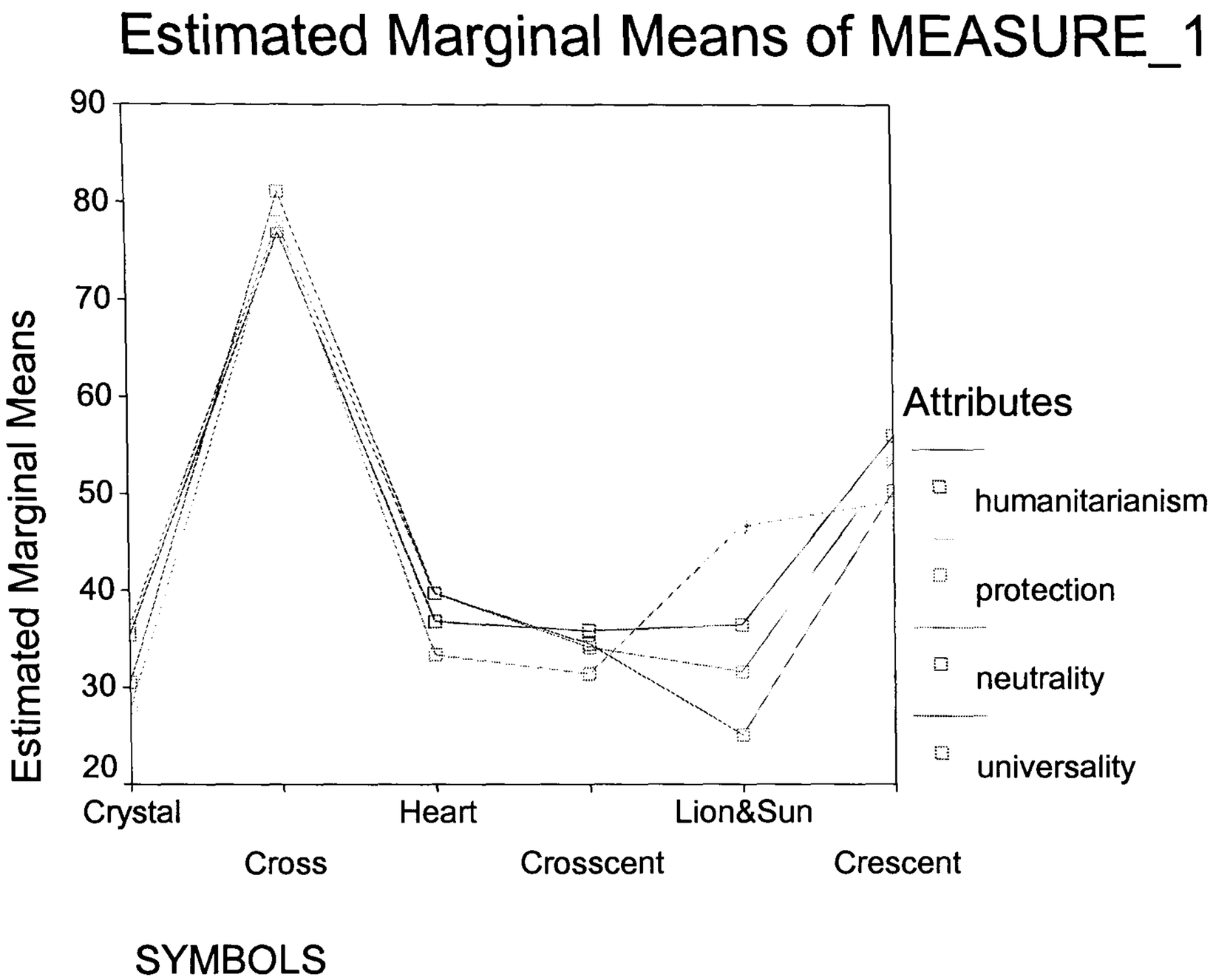
Means for groups in homogeneous subsets are displayed.
Based on Type III Sum of Squares
The error term is Mean Square(Error) = 201.603.

a. Uses Harmonic Mean Sample Size = 58.221.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

c. Alpha = .05.

rofile Plots



Appendix XI: SPSS output (studies 1, 2, and 3 correlations)

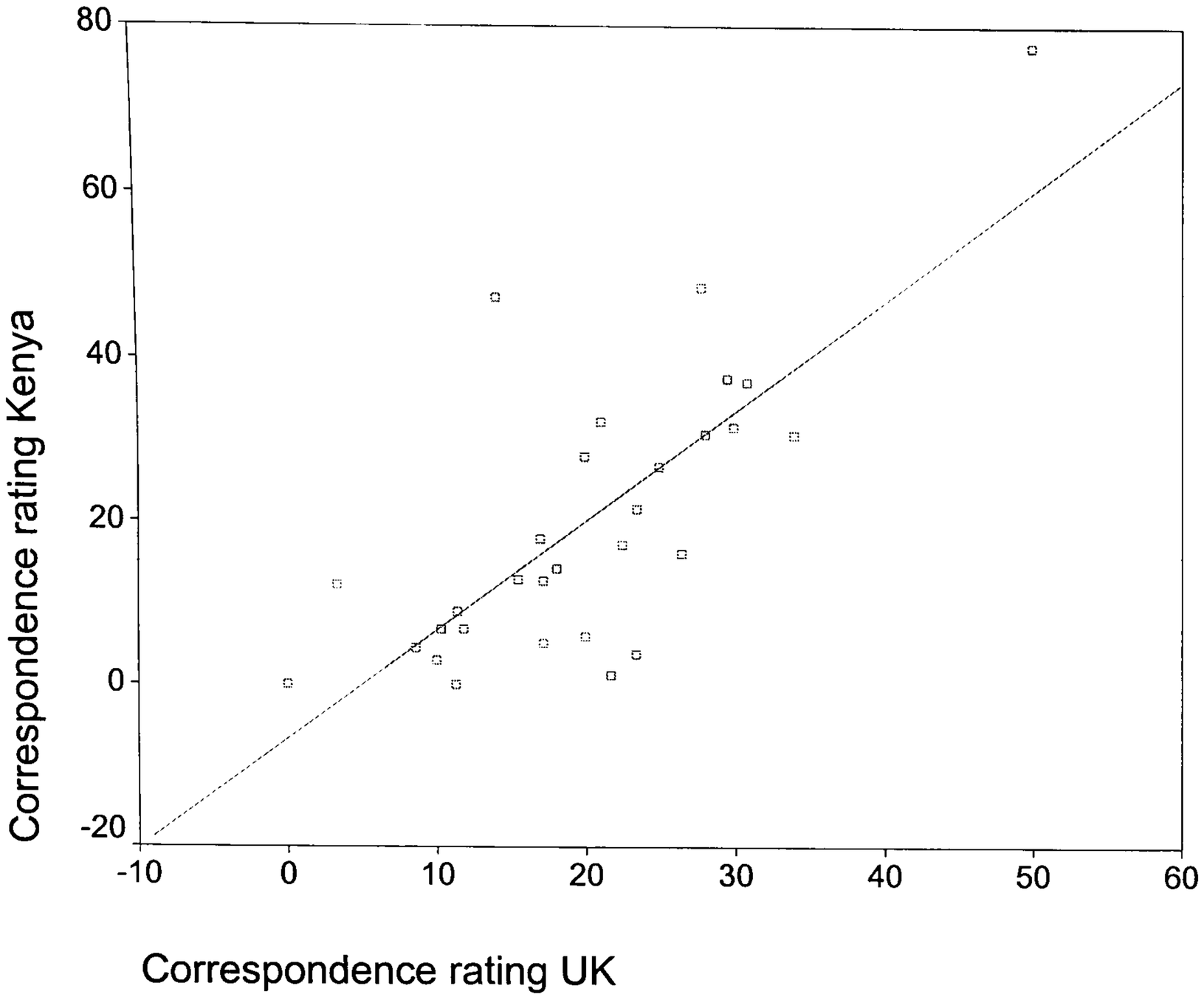
onparametric Correlations

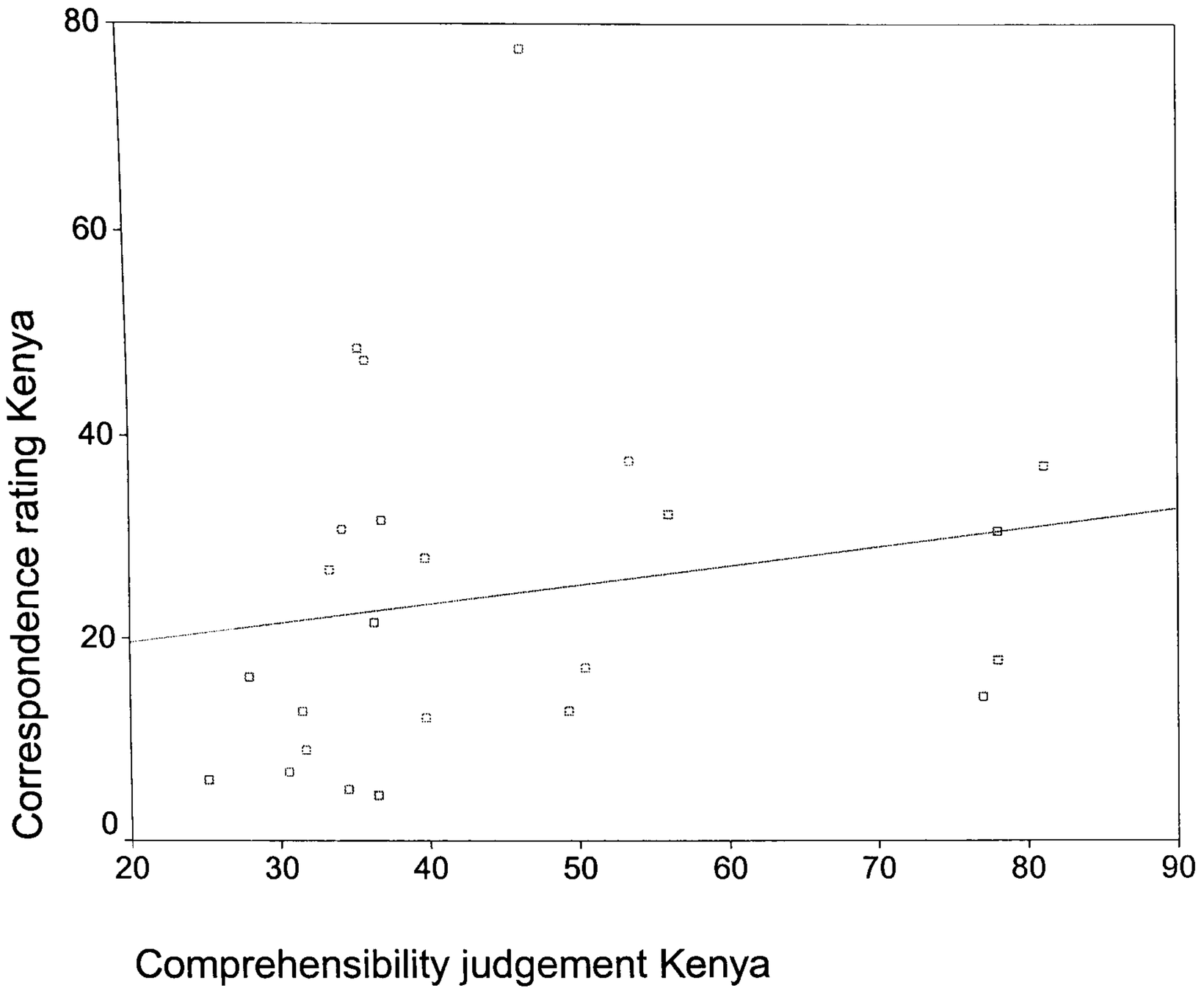
Correlations

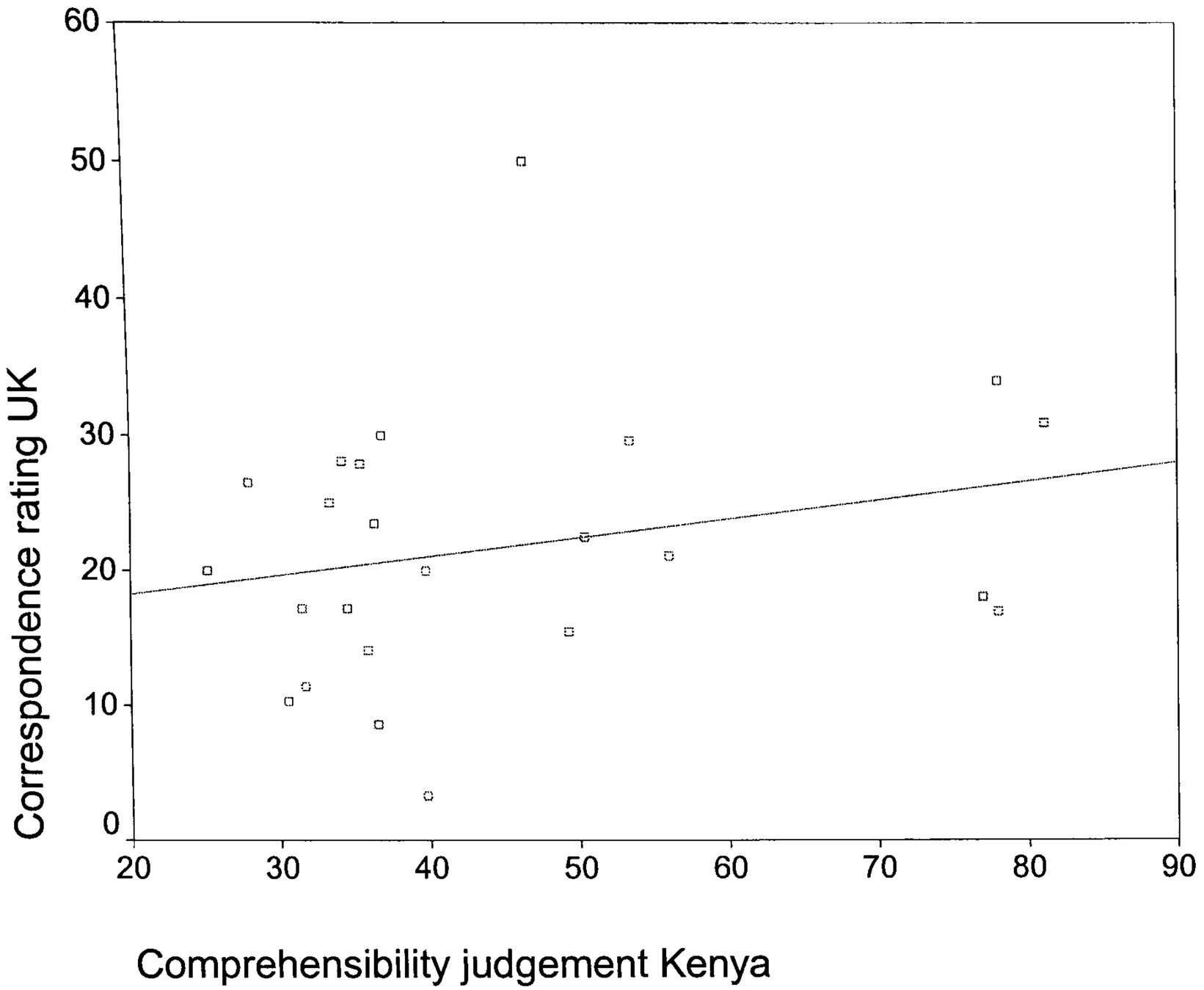
			Correspondence rating Kenya	Correspondence rating UK	Comprehensibility judgement Kenya
Kendall's tau_b	Correspondence rating Kenya	Correlation Coefficient	1.000	.524**	.290*
		Sig. (2-tailed)	.	.000	.047
		N	30	30	24
	Correspondence rating UK	Correlation Coefficient	.524**	1.000	.175
		Sig. (2-tailed)	.000	.	.234
		N	30	30	24
	Comprehensibility judgement Kenya	Correlation Coefficient	.290*	.175	1.000
		Sig. (2-tailed)	.047	.234	.
		N	24	24	24
Spearman's rho	Correspondence rating Kenya	Correlation Coefficient	1.000	.693**	.417*
		Sig. (2-tailed)	.	.000	.042
		N	30	30	24
	Correspondence rating UK	Correlation Coefficient	.693**	1.000	.274
		Sig. (2-tailed)	.000	.	.195
		N	30	30	24
	Comprehensibility judgement Kenya	Correlation Coefficient	.417*	.274	1.000
		Sig. (2-tailed)	.042	.195	.
		N	24	24	24

**. Correlation is significant at the .01 level (2-tailed).

*. Correlation is significant at the .05 level (2-tailed).


Correspondence rating Kenya
80
60
40
20
0
-20
-10
0
10
20
30
40
50
60
Correspondence rating UK


Correspondence rating Kenya
80
60
40
20
0
20
30
40
50
60
70
80
90
Comprehensibility judgement Kenya


Correspondence rating UK
60
50
40
30
20
10
0
20
30
40
50
60
70
80
90
Comprehensibility judgement Kenya

Appendix XII: SPSS output (studies 1 and 2 merged data)

Crosstab

			crystal_hum		Total
			Humanitarianism	No	
Country	Kenya	Count	5	51	56
		Expected Count	6.1	49.9	56.0
		% within Country	8.9%	91.1%	100.0%
	UK	Count	7	47	54
		Expected Count	5.9	48.1	54.0
		% within Country	13.0%	87.0%	100.0%
Total		Count	12	98	110
		Expected Count	12.0	98.0	110.0
		% within Country	10.9%	89.1%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.460[b]	1	.497		
Continuity Correction[a]	.139	1	.709		
Likelihood Ratio	.462	1	.497		
Fisher's Exact Test				.553	.355
Linear-by-Linear Association	.456	1	.499		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.89.

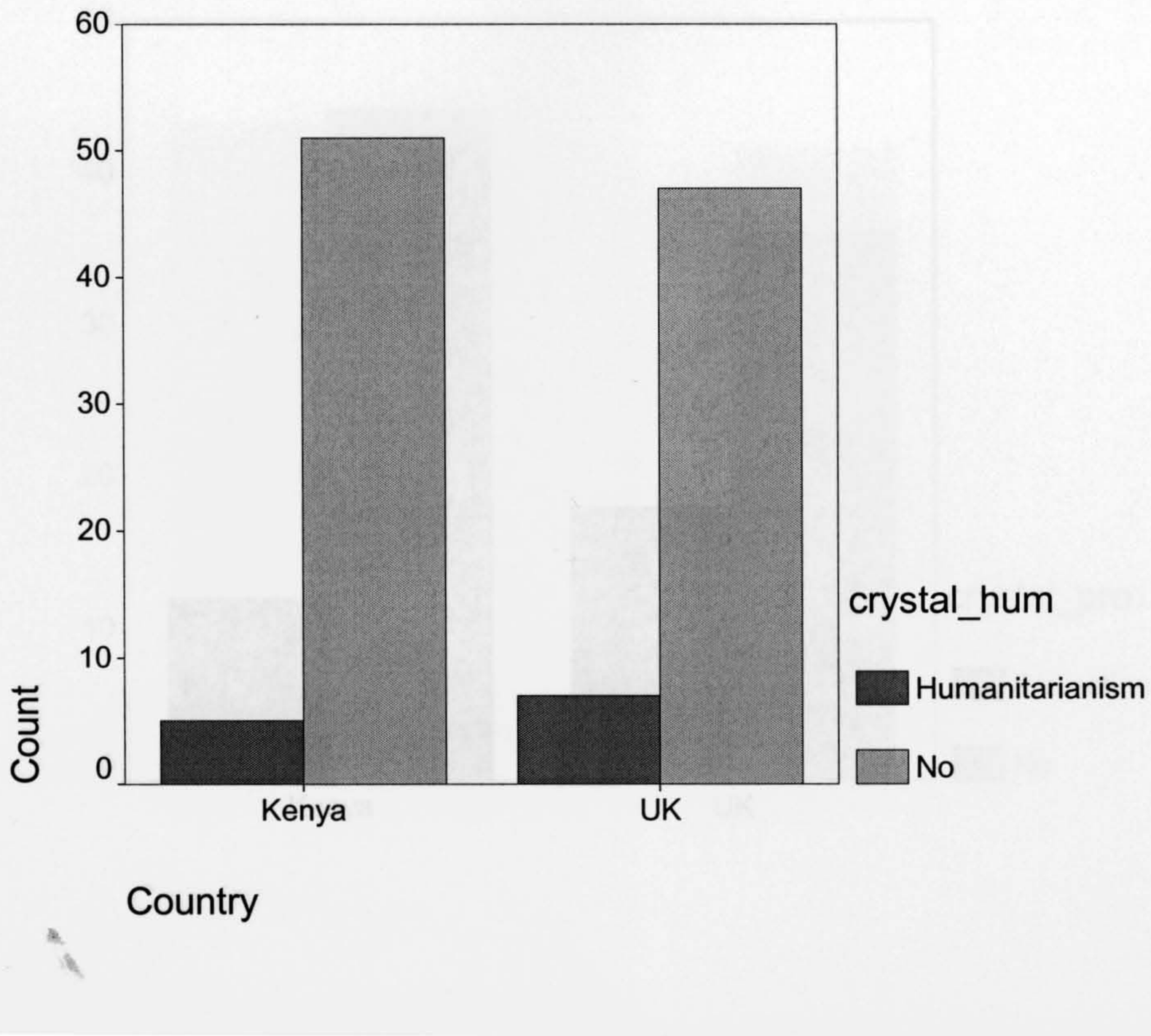
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	-.065	.094	-.674	.502[c]
Ordinal by Ordinal	Spearman Correlation	-.065	.094	-.674	.502[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

			crystal_pro		Total
			Protection	No	
Country	Kenya	Count	12	44	56
		Expected Count	15.3	40.7	56.0
		% within Country	21.4%	78.6%	100.0%
	UK	Count	18	36	54
		Expected Count	14.7	39.3	54.0
		% within Country	33.3%	66.7%	100.0%
Total		Count	30	80	110
		Expected Count	30.0	80.0	110.0
		% within Country	27.3%	72.7%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.964[b]	1	.161		
Continuity Correction[a]	1.410	1	.235		
Likelihood Ratio	1.973	1	.160		
Fisher's Exact Test				.201	.117
Linear-by-Linear Association	1.946	1	.163		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.73.

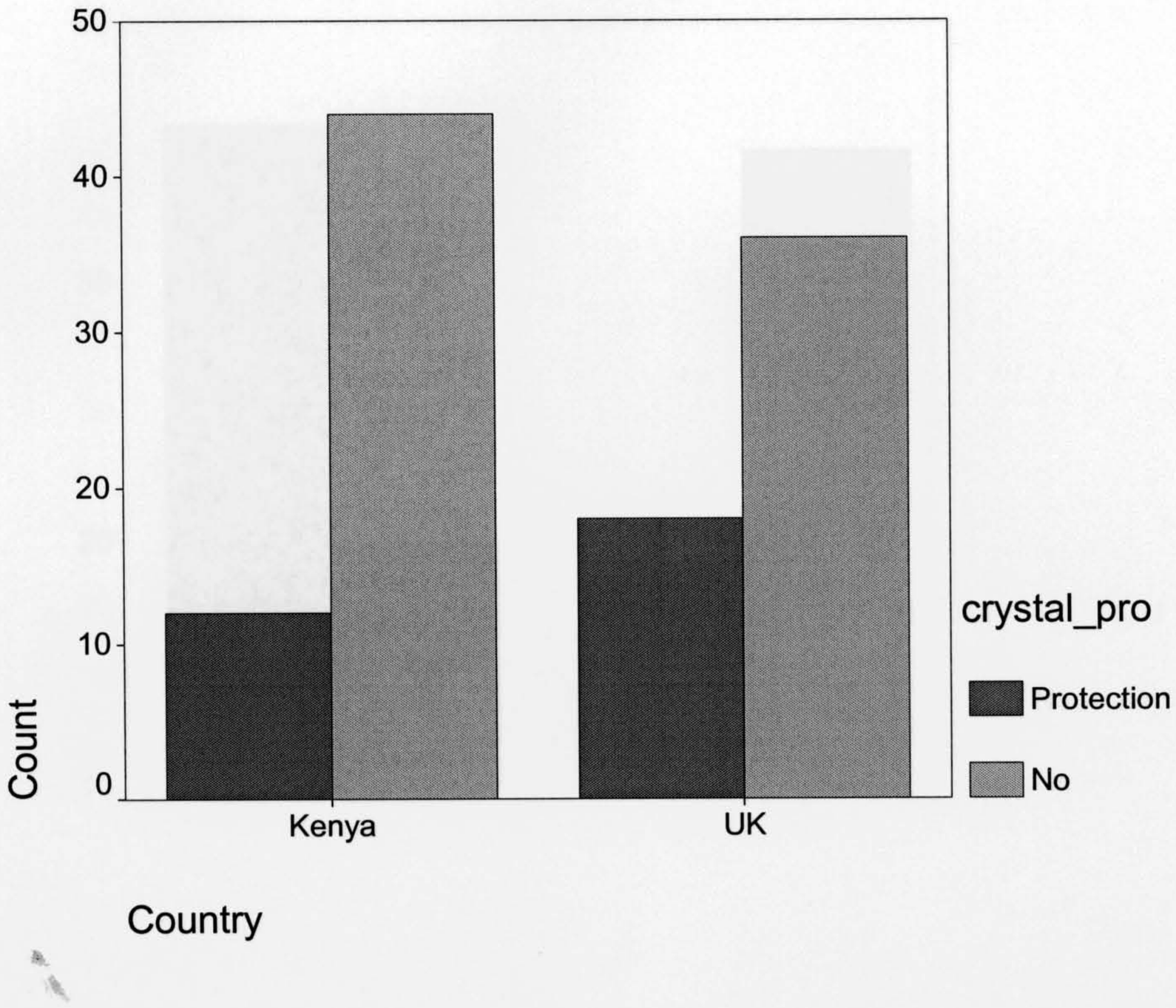
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	-.134	.094	-1.401	.164[c]
Ordinal by Ordinal	Spearman Correlation	-.134	.094	-1.401	.164[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

			crystal_neu		Total
			Neutrality	No	
Country	Kenya	Count	36	20	56
		Expected Count	28.0	28.0	56.0
		% within Country	64.3%	35.7%	100.0%
	UK	Count	19	35	54
		Expected Count	27.0	27.0	54.0
		% within Country	35.2%	64.8%	100.0%
Total		Count	55	55	110
		Expected Count	55.0	55.0	110.0
		% within Country	50.0%	50.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	9.312[b]	1	.002		
Continuity Correction[a]	8.185	1	.004		
Likelihood Ratio	9.448	1	.002		
Fisher's Exact Test				.004	.002
Linear-by-Linear Association	9.228	1	.002		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 27.00.

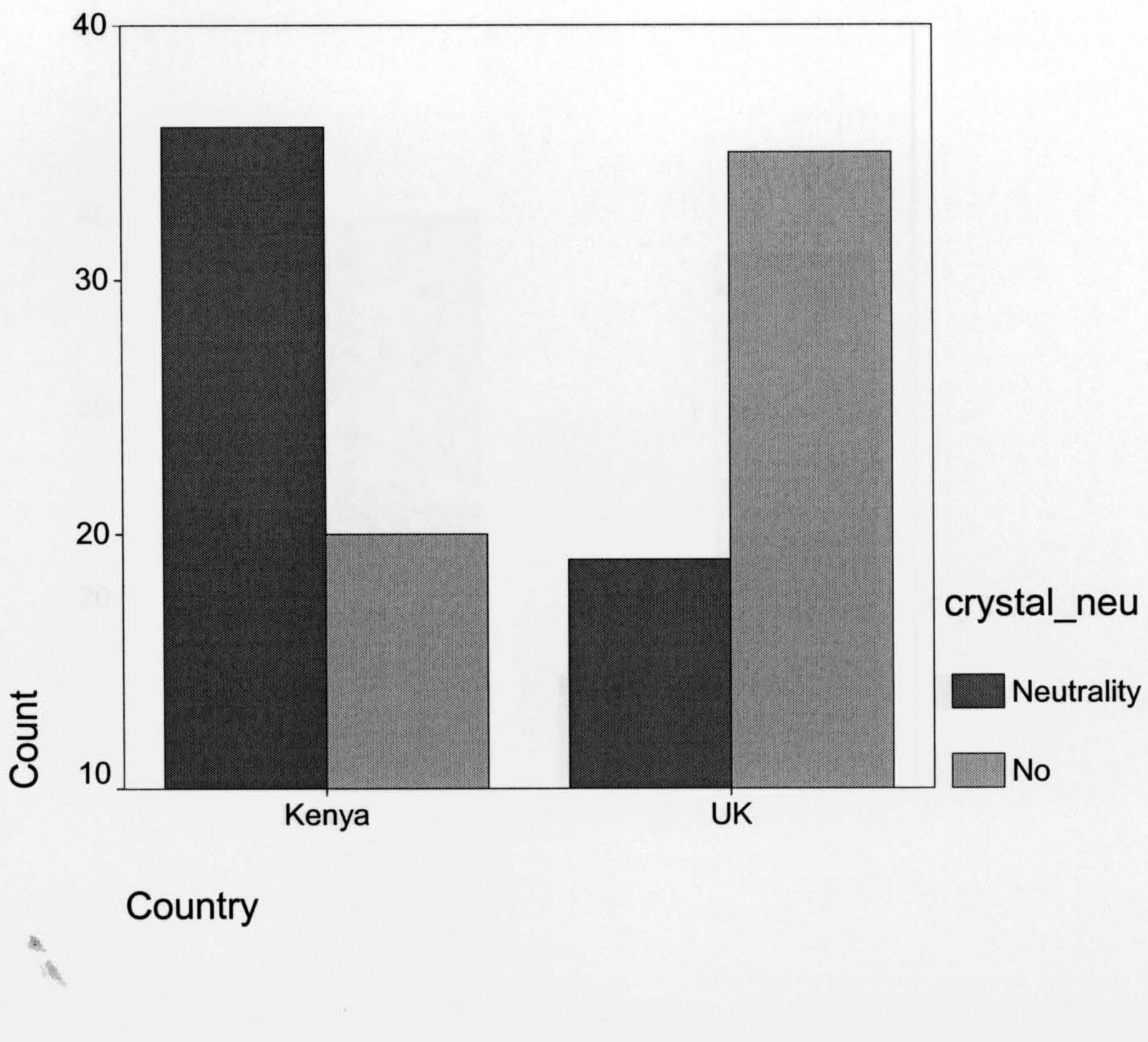
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.291	.091	3.160	.002[c]
Ordinal by Ordinal	Spearman Correlation	.291	.091	3.160	.002[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

			crystal_uni		
			Universality	No	Total
Country	Kenya	Count	16	40	56
		Expected Count	16.3	39.7	56.0
		% within Country	28.6%	71.4%	100.0%
	UK	Count	16	38	54
		Expected Count	15.7	38.3	54.0
		% within Country	29.6%	70.4%	100.0%
Total		Count	32	78	110
		Expected Count	32.0	78.0	110.0
		% within Country	29.1%	70.9%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.015[b]	1	.903		
Continuity Correction[a]	.000	1	1.000		
Likelihood Ratio	.015	1	.903		
Fisher's Exact Test				1.000	.535
Linear-by-Linear Association	.015	1	.903		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 15.71.

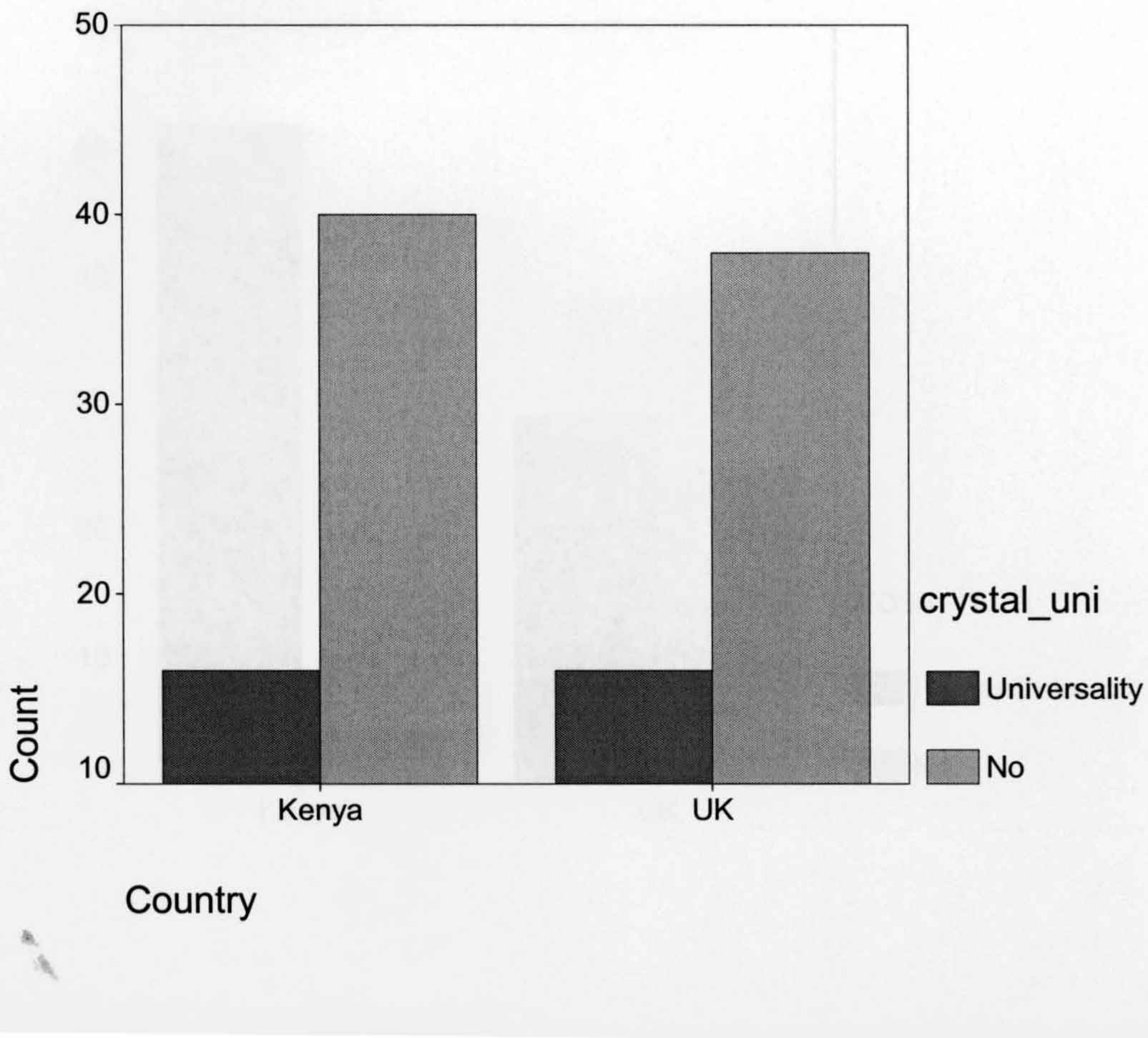
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	-.012	.095	-.121	.904[c]
Ordinal by Ordinal	Spearman Correlation	-.012	.095	-.121	.904[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

			cross_hum		Total
			Humanitarianism	No	
Country	Kenya	Count	52	4	56
		Expected Count	41.2	14.8	56.0
		% within Country	92.9%	7.1%	100.0%
	UK	Count	29	25	54
		Expected Count	39.8	14.2	54.0
		% within Country	53.7%	46.3%	100.0%
Total		Count	81	29	110
		Expected Count	81.0	29.0	110.0
		% within Country	73.6%	26.4%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	21.709[b]	1	.000		
Continuity Correction[a]	19.739	1	.000		
Likelihood Ratio	23.519	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	21.511	1	.000		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.24.

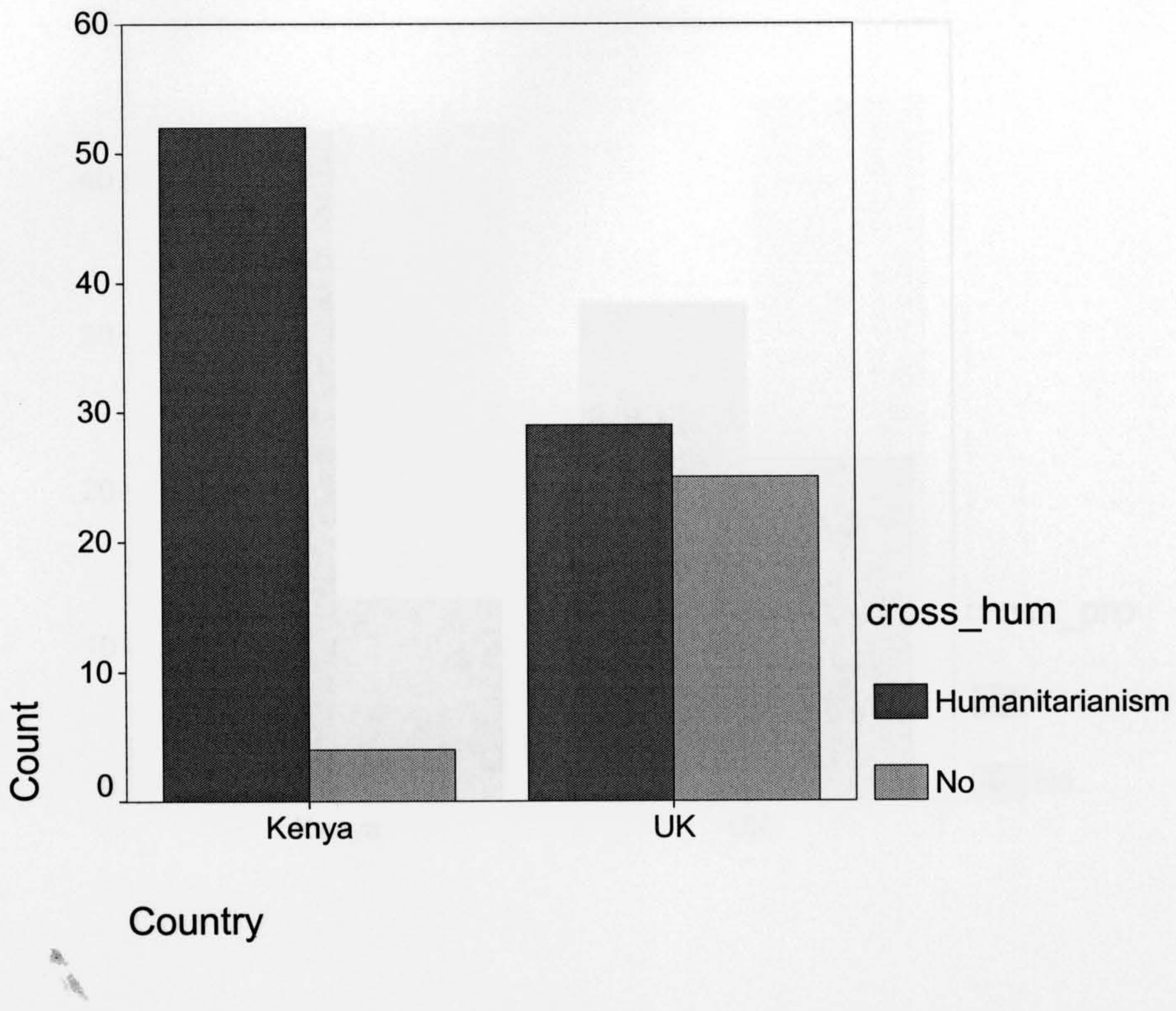
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.444	.077	5.153	.000[c]
Ordinal by Ordinal	Spearman Correlation	.444	.077	5.153	.000[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

			cross_pro		
			Protection	No	Total
Country	Kenya	Count	43	13	56
		Expected Count	38.2	17.8	56.0
		% within Country	76.8%	23.2%	100.0%
	UK	Count	32	22	54
		Expected Count	36.8	17.2	54.0
		% within Country	59.3%	40.7%	100.0%
Total		Count	75	35	110
		Expected Count	75.0	35.0	110.0
		% within Country	68.2%	31.8%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.893[b]	1	.049		
Continuity Correction[a]	3.127	1	.077		
Likelihood Ratio	3.923	1	.048		
Fisher's Exact Test				.065	.038
Linear-by-Linear Association	3.857	1	.050		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 17.18.

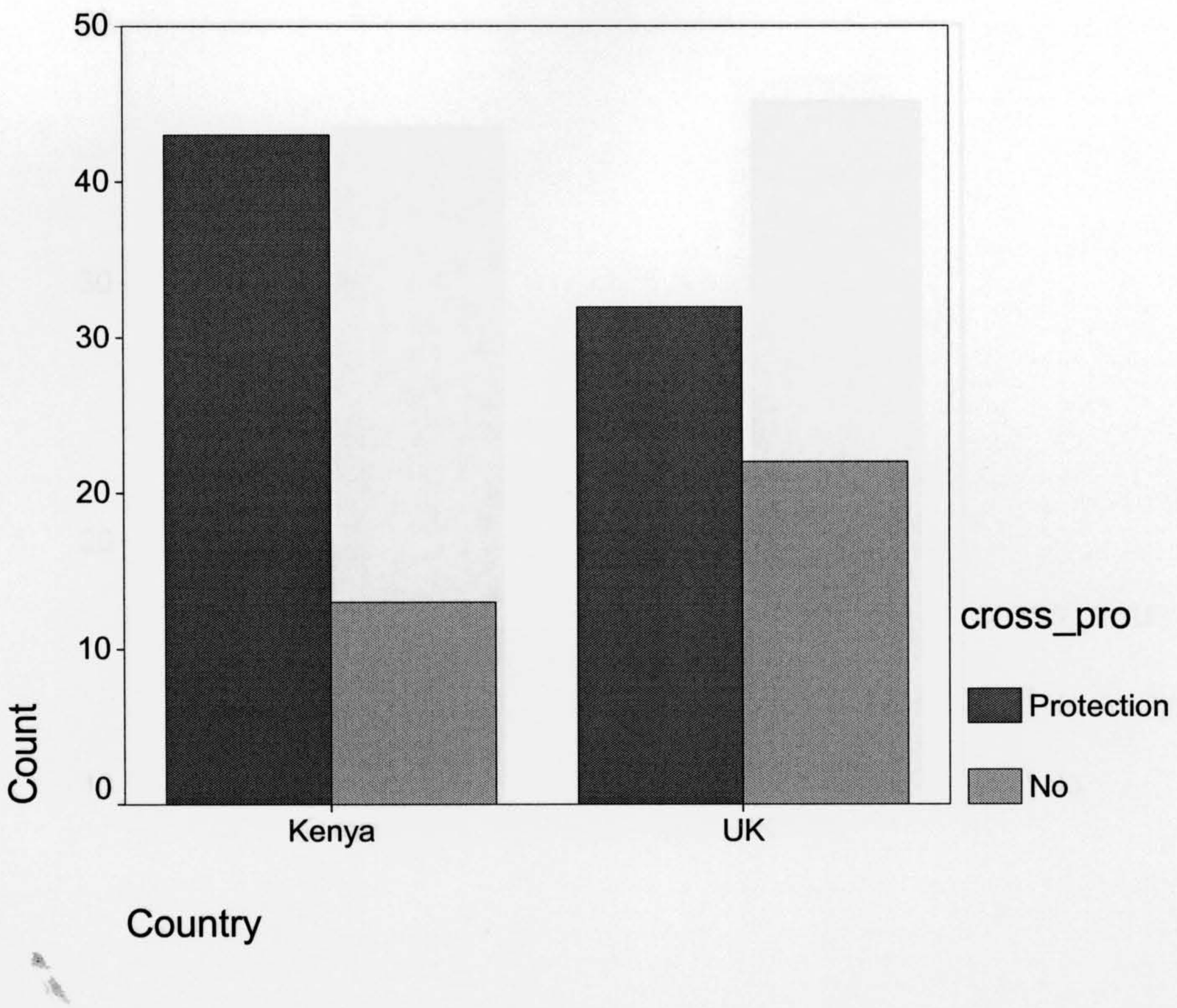
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.188	.093	1.990	.049[c]
Ordinal by Ordinal	Spearman Correlation	.188	.093	1.990	.049[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

			cross_neu		
			Neutrality	No	Total
Country	Kenya	Count	20	36	56
		Expected Count	18.8	37.2	56.0
		% within Country	35.7%	64.3%	100.0%
	UK	Count	17	37	54
		Expected Count	18.2	35.8	54.0
		% within Country	31.5%	68.5%	100.0%
Total		Count	37	73	110
		Expected Count	37.0	73.0	110.0
		% within Country	33.6%	66.4%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.221[b]	1	.639		
Continuity Correction[a]	.072	1	.789		
Likelihood Ratio	.221	1	.638		
Fisher's Exact Test				.689	.395
Linear-by-Linear Association	.219	1	.640		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 18.16.

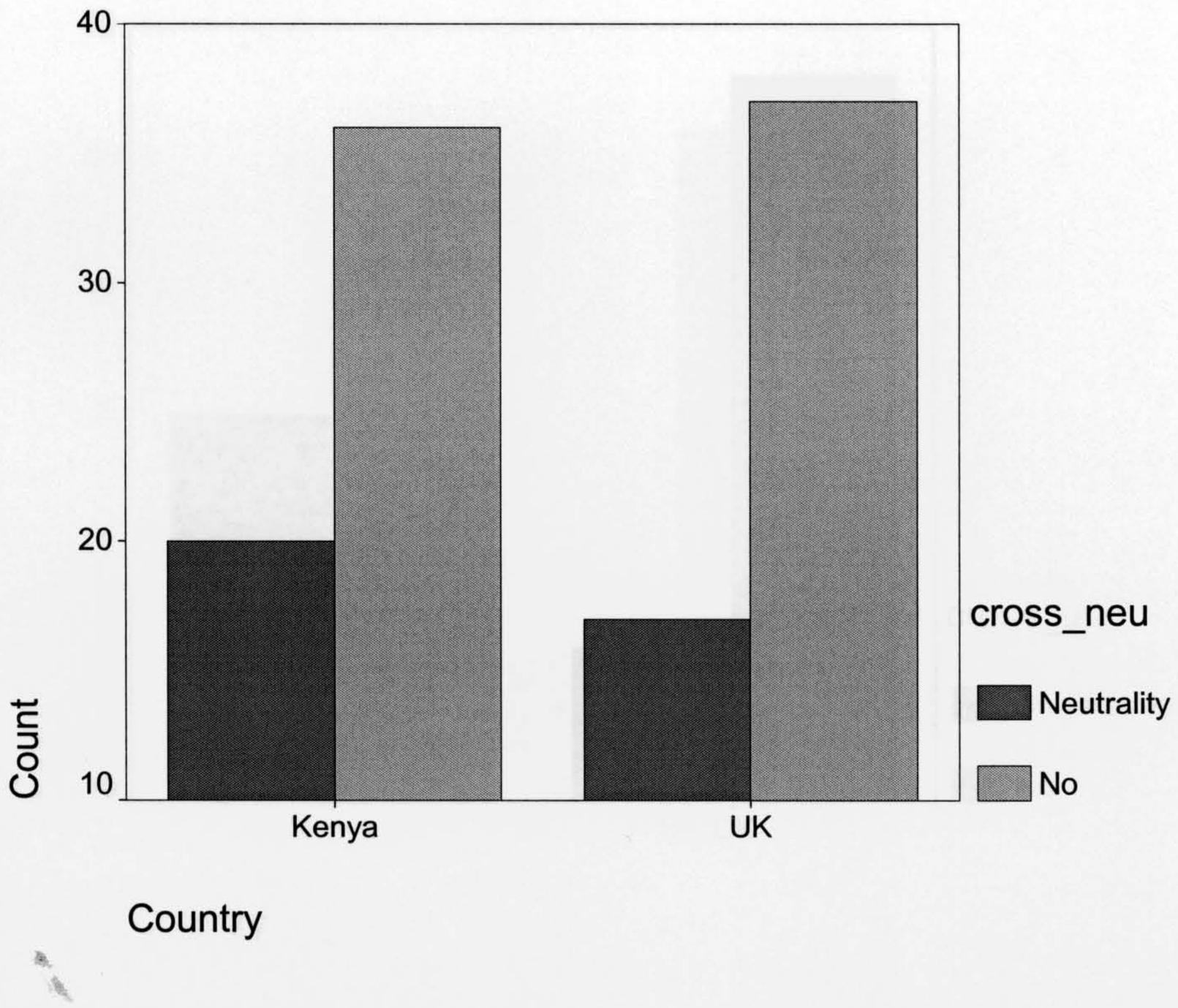
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.045	.095	.466	.642[c]
Ordinal by Ordinal	Spearman Correlation	.045	.095	.466	.642[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

			cross_uni		Total
			Universality	No	
Country	Kenya	Count	25	31	56
		Expected Count	20.9	35.1	56.0
		% within Country	44.6%	55.4%	100.0%
	UK	Count	16	38	54
		Expected Count	20.1	33.9	54.0
		% within Country	29.6%	70.4%	100.0%
Total		Count	41	69	110
		Expected Count	41.0	69.0	110.0
		% within Country	37.3%	62.7%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.650[b]	1	.104		
Continuity Correction[a]	2.047	1	.153		
Likelihood Ratio	2.667	1	.102		
Fisher's Exact Test				.118	.076
Linear-by-Linear Association	2.626	1	.105		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 20.13.

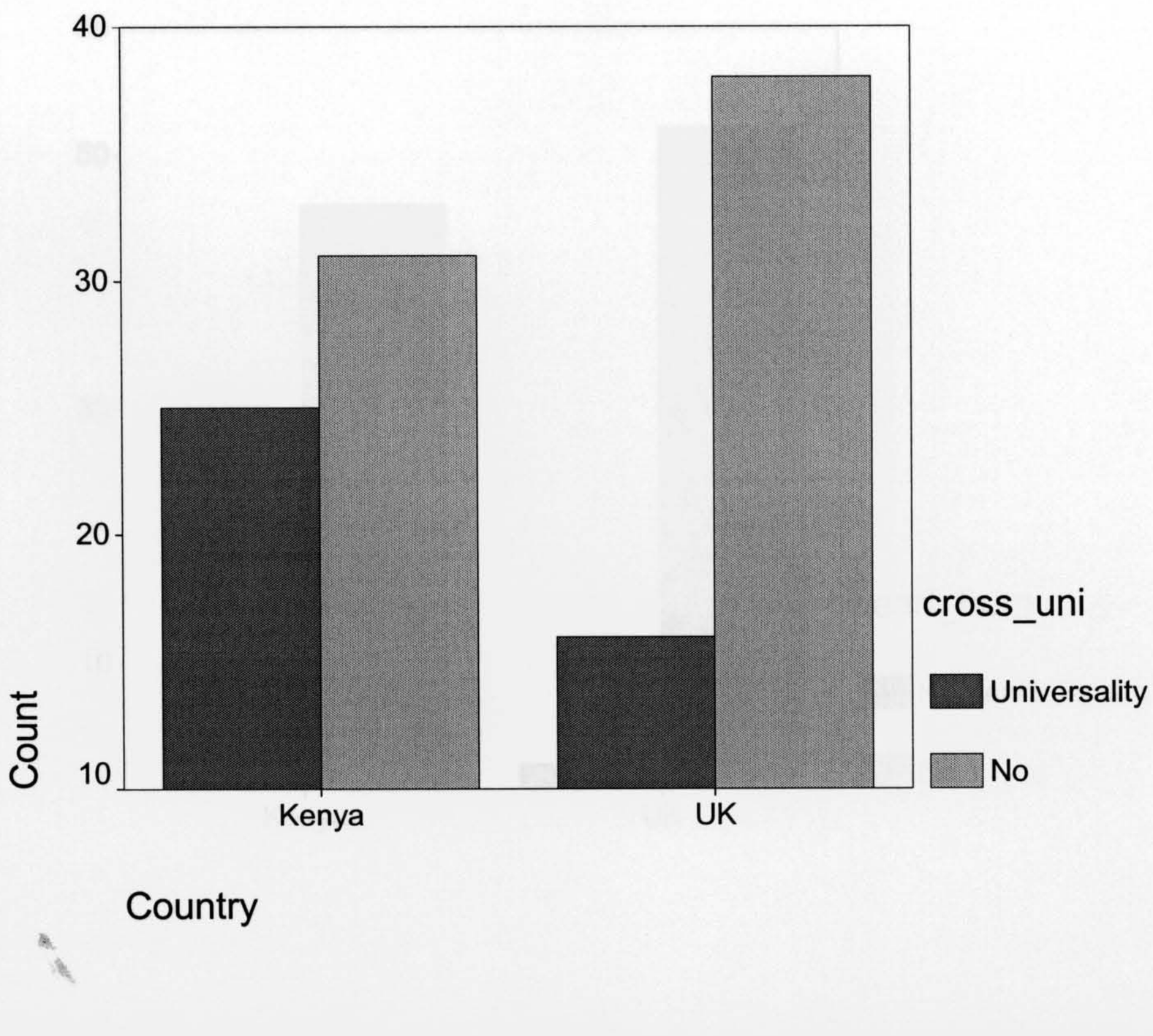
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.155	.094	1.633	.105[c]
Ordinal by Ordinal	Spearman Correlation	.155	.094	1.633	.105[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

			heart_hum		Total
			Humanitarianism	No	
Country	Kenya	Count	10	46	56
		Expected Count	6.1	49.9	56.0
		% within Country	17.9%	82.1%	100.0%
	UK	Count	2	52	54
		Expected Count	5.9	48.1	54.0
		% within Country	3.7%	96.3%	100.0%
Total		Count	12	98	110
		Expected Count	12.0	98.0	110.0
		% within Country	10.9%	89.1%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.666[b]	1	.017		
Continuity Correction[a]	4.303	1	.038		
Likelihood Ratio	6.153	1	.013		
Fisher's Exact Test				.029	.017
Linear-by-Linear Association	5.615	1	.018		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.89.

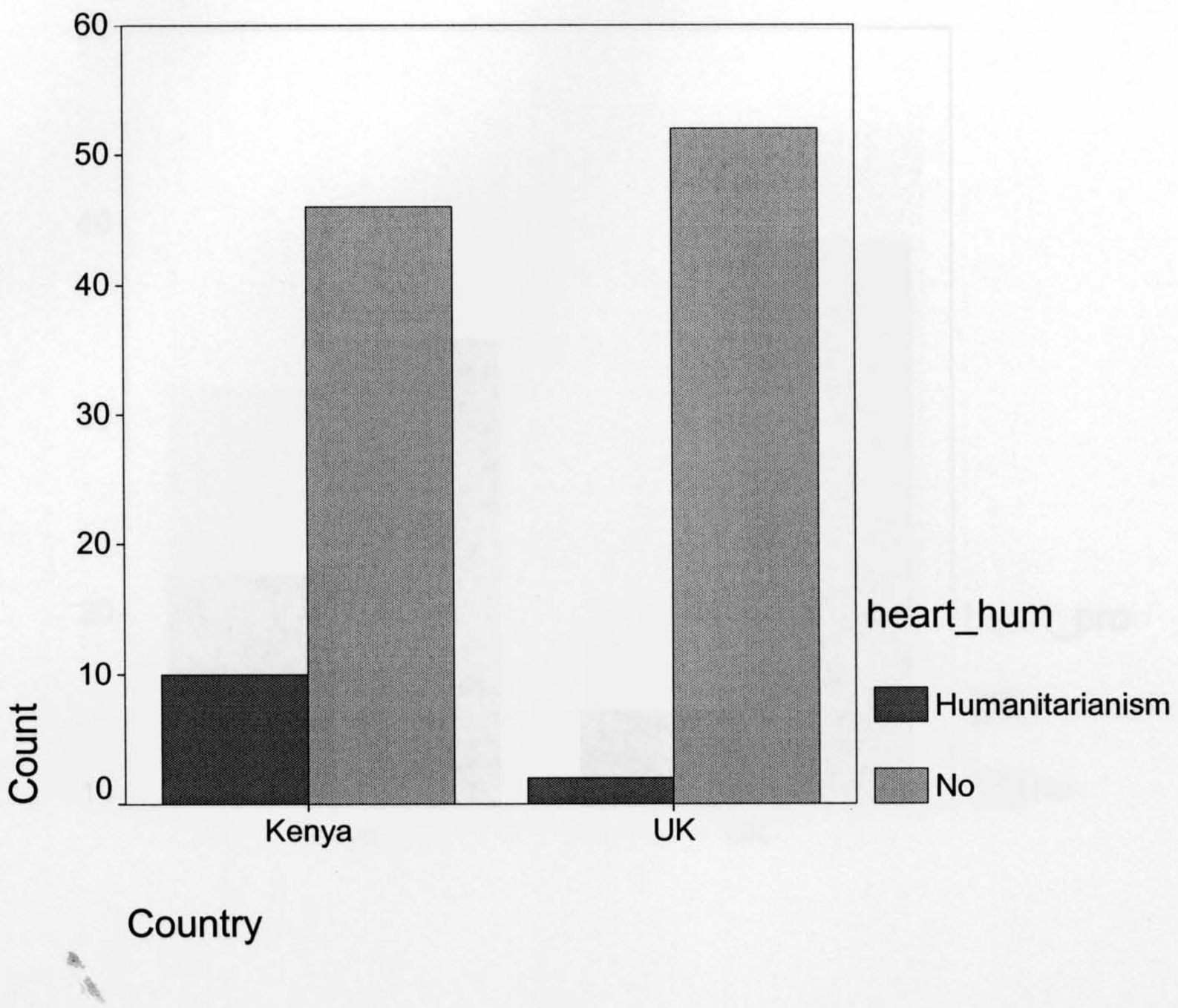
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.227	.079	2.422	.017[c]
Ordinal by Ordinal	Spearman Correlation	.227	.079	2.422	.017[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

			heart_pro		Total
			Protection	No	
Country	Kenya	Count	22	34	56
		Expected Count	18.8	37.2	56.0
		% within Country	39.3%	60.7%	100.0%
	UK	Count	15	39	54
		Expected Count	18.2	35.8	54.0
		% within Country	27.8%	72.2%	100.0%
Total		Count	37	73	110
		Expected Count	37.0	73.0	110.0
		% within Country	33.6%	66.4%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.631[b]	1	.202		
Continuity Correction[a]	1.156	1	.282		
Likelihood Ratio	1.639	1	.201		
Fisher's Exact Test				.230	.141
Linear-by-Linear Association	1.616	1	.204		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 18.16.

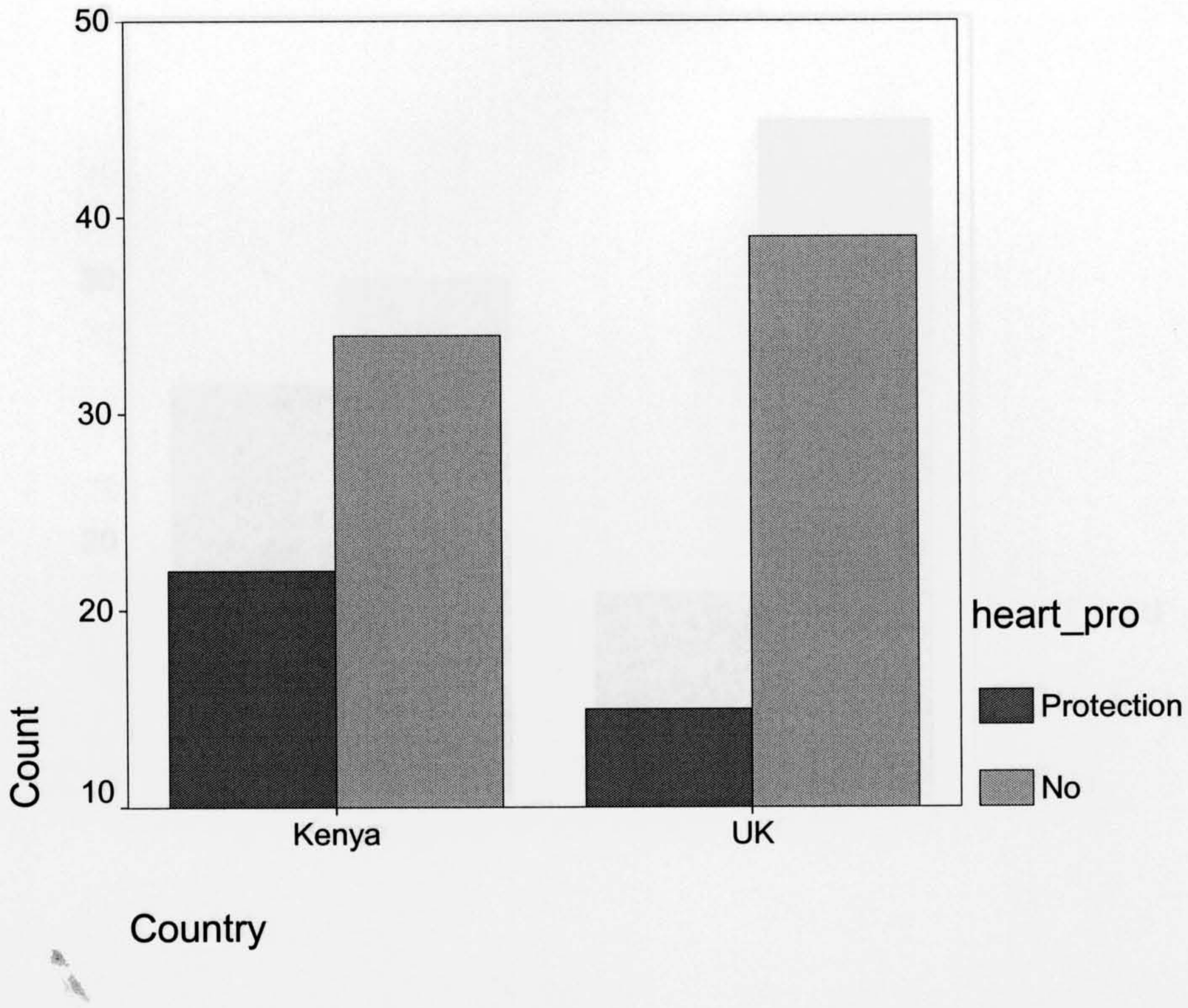
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.122	.094	1.275	.205[c]
Ordinal by Ordinal	Spearman Correlation	.122	.094	1.275	.205[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

			heart_neu		Total
			Neutrality	No	
Country	Kenya	Count	26	30	56
		Expected Count	22.4	33.6	56.0
		% within Country	46.4%	53.6%	100.0%
	UK	Count	18	36	54
		Expected Count	21.6	32.4	54.0
		% within Country	33.3%	66.7%	100.0%
Total		Count	44	66	110
		Expected Count	44.0	66.0	110.0
		% within Country	40.0%	60.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.964[b]	1	.161		
Continuity Correction[a]	1.457	1	.227		
Likelihood Ratio	1.973	1	.160		
Fisher's Exact Test				.178	.114
Linear-by-Linear Association	1.946	1	.163		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 21.60.

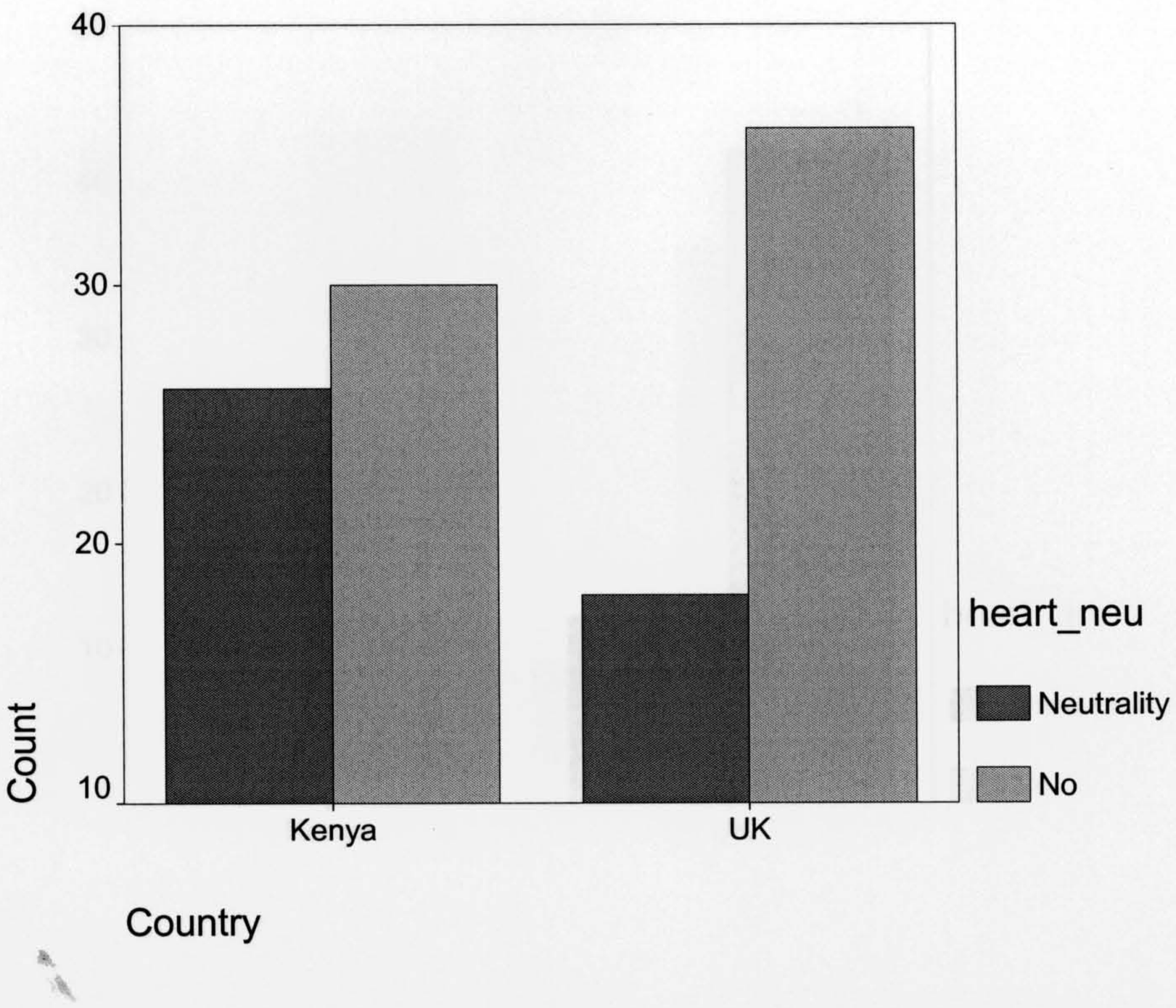
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.134	.094	1.401	.164[c]
Ordinal by Ordinal	Spearman Correlation	.134	.094	1.401	.164[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

			heart_uni		Total
			Universality	No	
Country	Kenya	Count	23	33	56
		Expected Count	17.8	38.2	56.0
		% within Country	41.1%	58.9%	100.0%
	UK	Count	12	42	54
		Expected Count	17.2	36.8	54.0
		% within Country	22.2%	77.8%	100.0%
Total		Count	35	75	110
		Expected Count	35.0	75.0	110.0
		% within Country	31.8%	68.2%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.502[b]	1	.034		
Continuity Correction[a]	3.675	1	.055		
Likelihood Ratio	4.563	1	.033		
Fisher's Exact Test				.042	.027
Linear-by-Linear Association	4.461	1	.035		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 17.18.

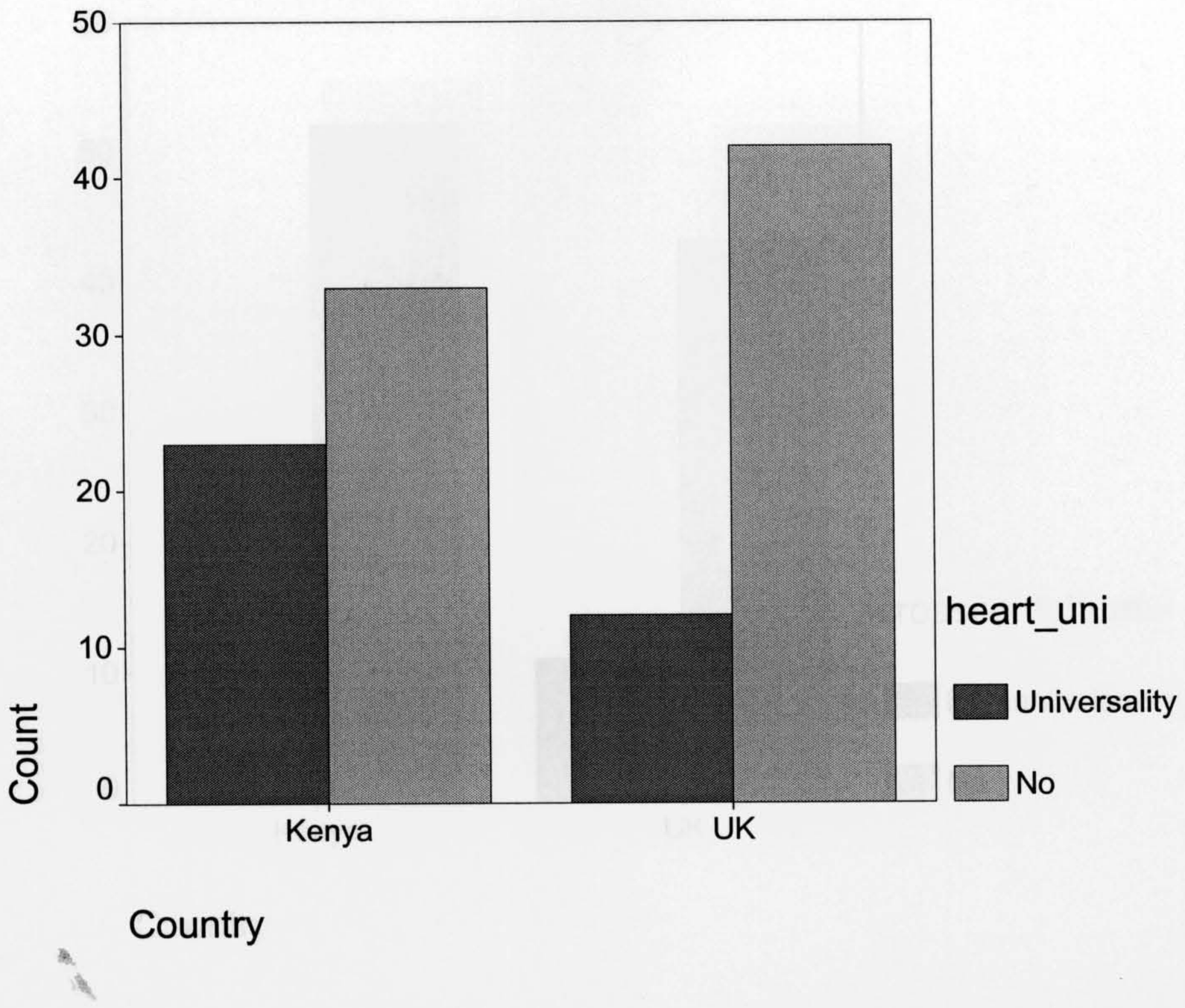
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.202	.092	2.147	.034[c]
Ordinal by Ordinal	Spearman Correlation	.202	.092	2.147	.034[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

			crosscent_hum		Total
			Humanitarianism	No	
Country	Kenya	Count	4	52	56
		Expected Count	7.6	48.4	56.0
		% within Country	7.1%	92.9%	100.0%
	UK	Count	11	43	54
		Expected Count	7.4	46.6	54.0
		% within Country	20.4%	79.6%	100.0%
Total		Count	15	95	110
		Expected Count	15.0	95.0	110.0
		% within Country	13.6%	86.4%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.084[b]	1	.043		
Continuity Correction[a]	3.038	1	.081		
Likelihood Ratio	4.215	1	.040		
Fisher's Exact Test				.054	.040
Linear-by-Linear Association	4.047	1	.044		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.36.

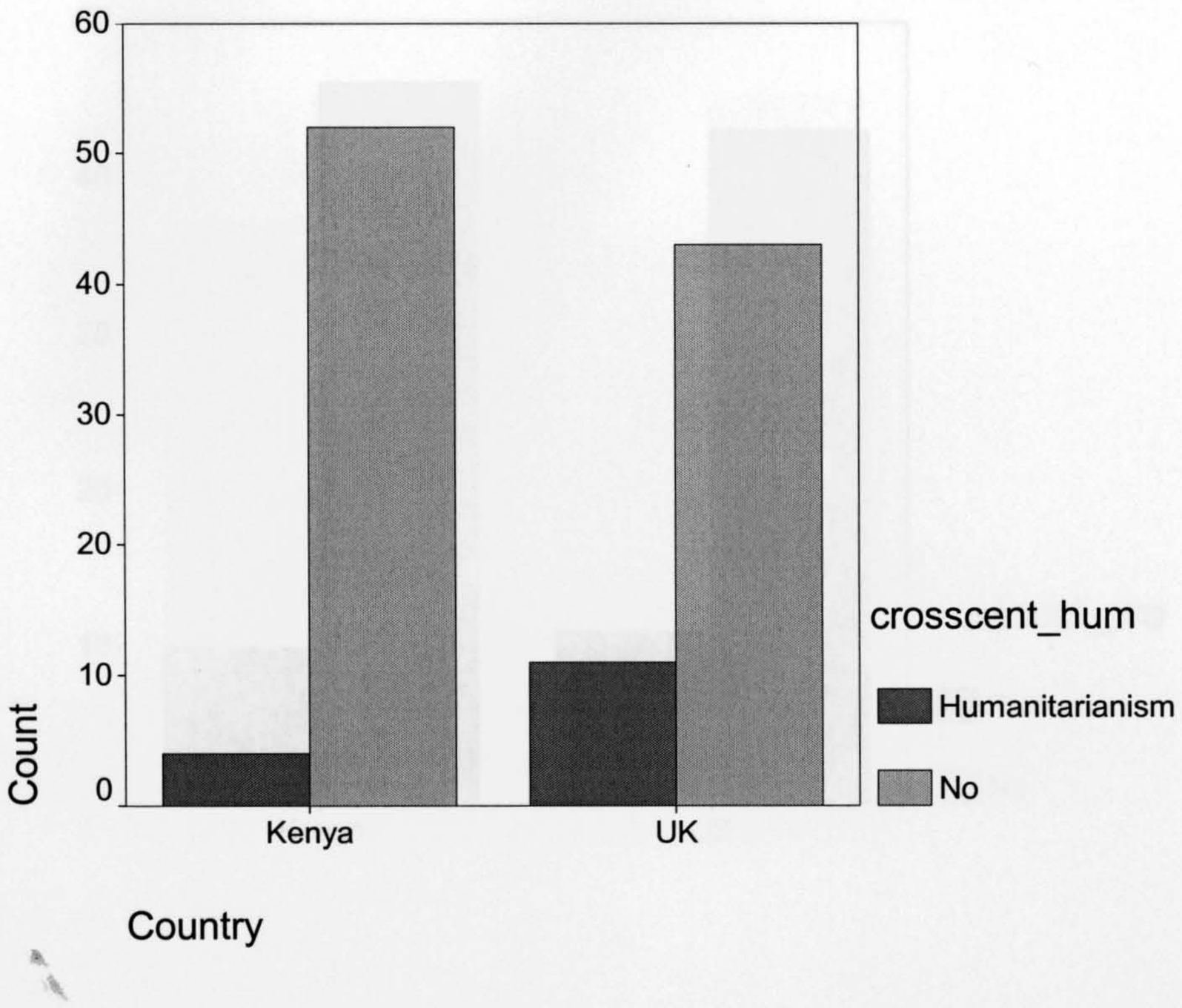
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	-.193	.088	-2.041	.044[c]
Ordinal by Ordinal	Spearman Correlation	-.193	.088	-2.041	.044[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

			crosscent_pro		Total
			Protection	No	
Country	Kenya	Count	10	46	56
		Expected Count	10.7	45.3	56.0
		% within Country	17.9%	82.1%	100.0%
	UK	Count	11	43	54
		Expected Count	10.3	43.7	54.0
		% within Country	20.4%	79.6%	100.0%
Total		Count	21	89	110
		Expected Count	21.0	89.0	110.0
		% within Country	19.1%	80.9%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.112[b]	1	.737		
Continuity Correction[a]	.009	1	.926		
Likelihood Ratio	.112	1	.737		
Fisher's Exact Test				.811	.463
Linear-by-Linear Association	.111	1	.739		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.31.

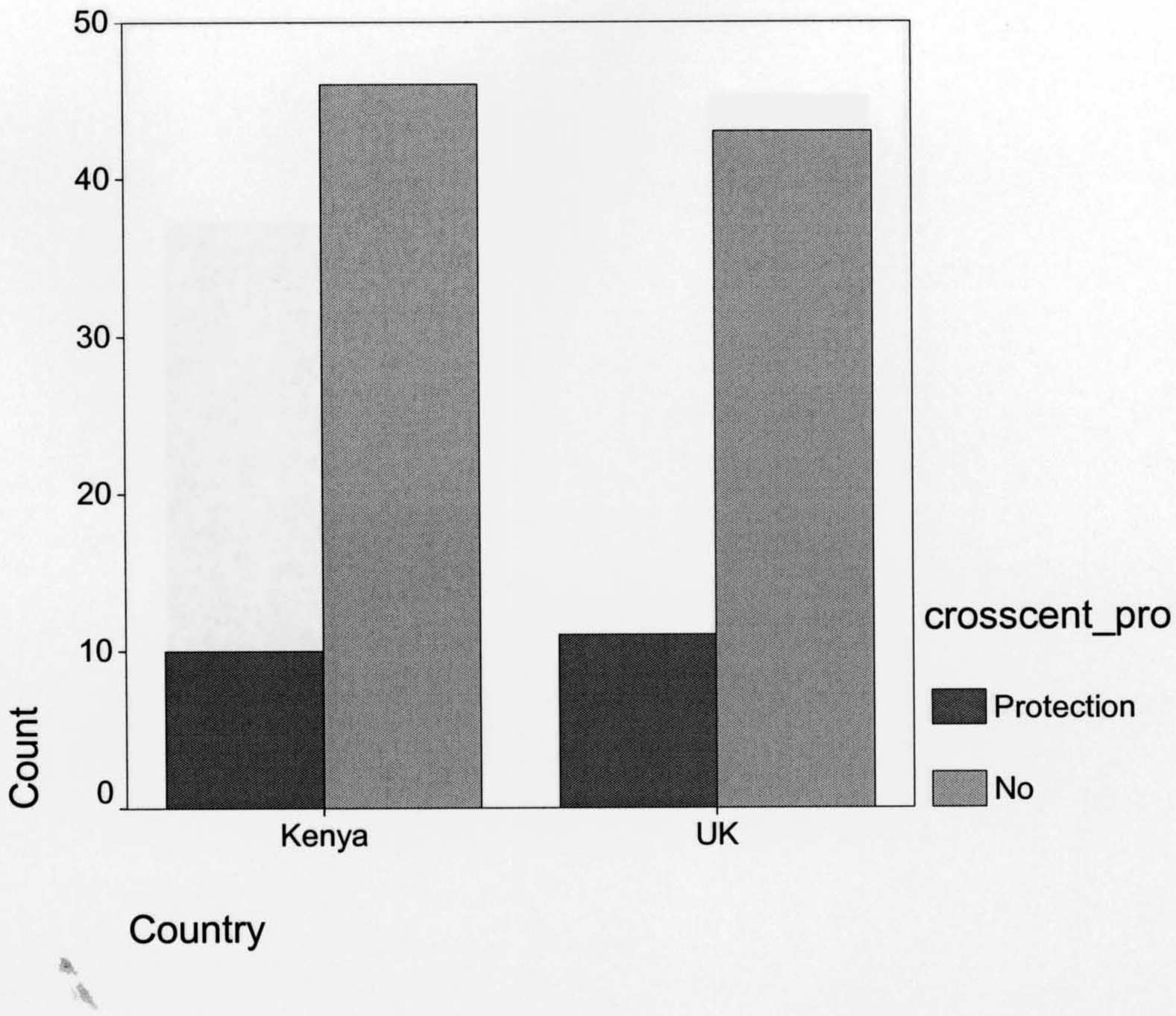
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	-.032	.095	-.332	.740[c]
Ordinal by Ordinal	Spearman Correlation	-.032	.095	-.332	.740[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

			crosscent_neu		Total
			Neutrality	No	
Country	Kenya	Count	37	19	56
		Expected Count	23.4	32.6	56.0
		% within Country	66.1%	33.9%	100.0%
	UK	Count	9	45	54
		Expected Count	22.6	31.4	54.0
		% within Country	16.7%	83.3%	100.0%
Total		Count	46	64	110
		Expected Count	46.0	64.0	110.0
		% within Country	41.8%	58.2%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	27.579[b]	1	.000		
Continuity Correction[a]	25.586	1	.000		
Likelihood Ratio	29.130	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	27.328	1	.000		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 22.58.

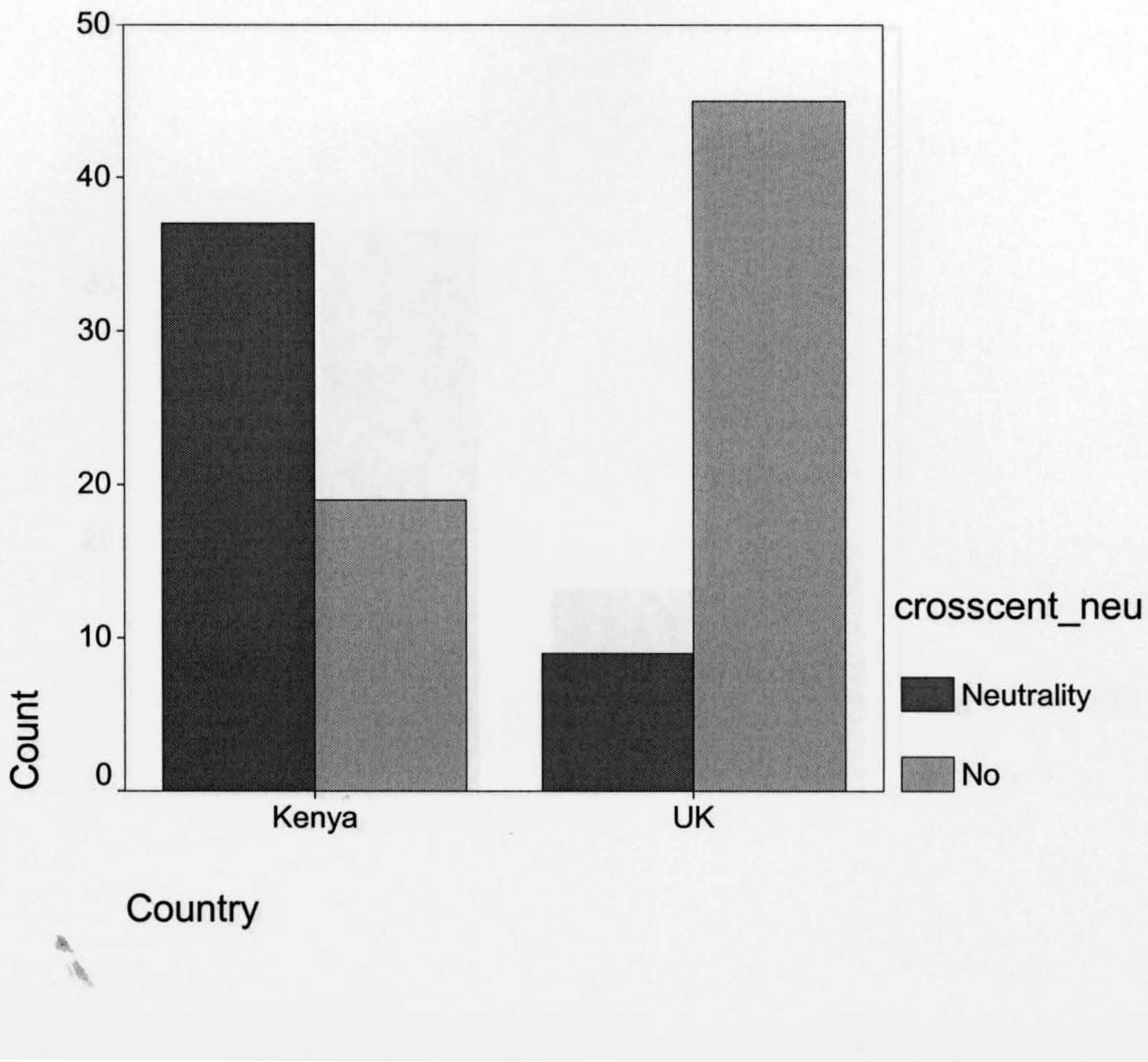
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.501	.081	6.011	.000[c]
Ordinal by Ordinal	Spearman Correlation	.501	.081	6.011	.000[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

			crosscent_uni		Total
			Universality	No	
Country	Kenya	Count	24	32	56
		Expected Count	21.4	34.6	56.0
		% within Country	42.9%	57.1%	100.0%
	UK	Count	18	36	54
		Expected Count	20.6	33.4	54.0
		% within Country	33.3%	66.7%	100.0%
Total		Count	42	68	110
		Expected Count	42.0	68.0	110.0
		% within Country	38.2%	61.8%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.056[b]	1	.304		
Continuity Correction[a]	.691	1	.406		
Likelihood Ratio	1.059	1	.303		
Fisher's Exact Test				.332	.203
Linear-by-Linear Association	1.047	1	.306		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 20.62.

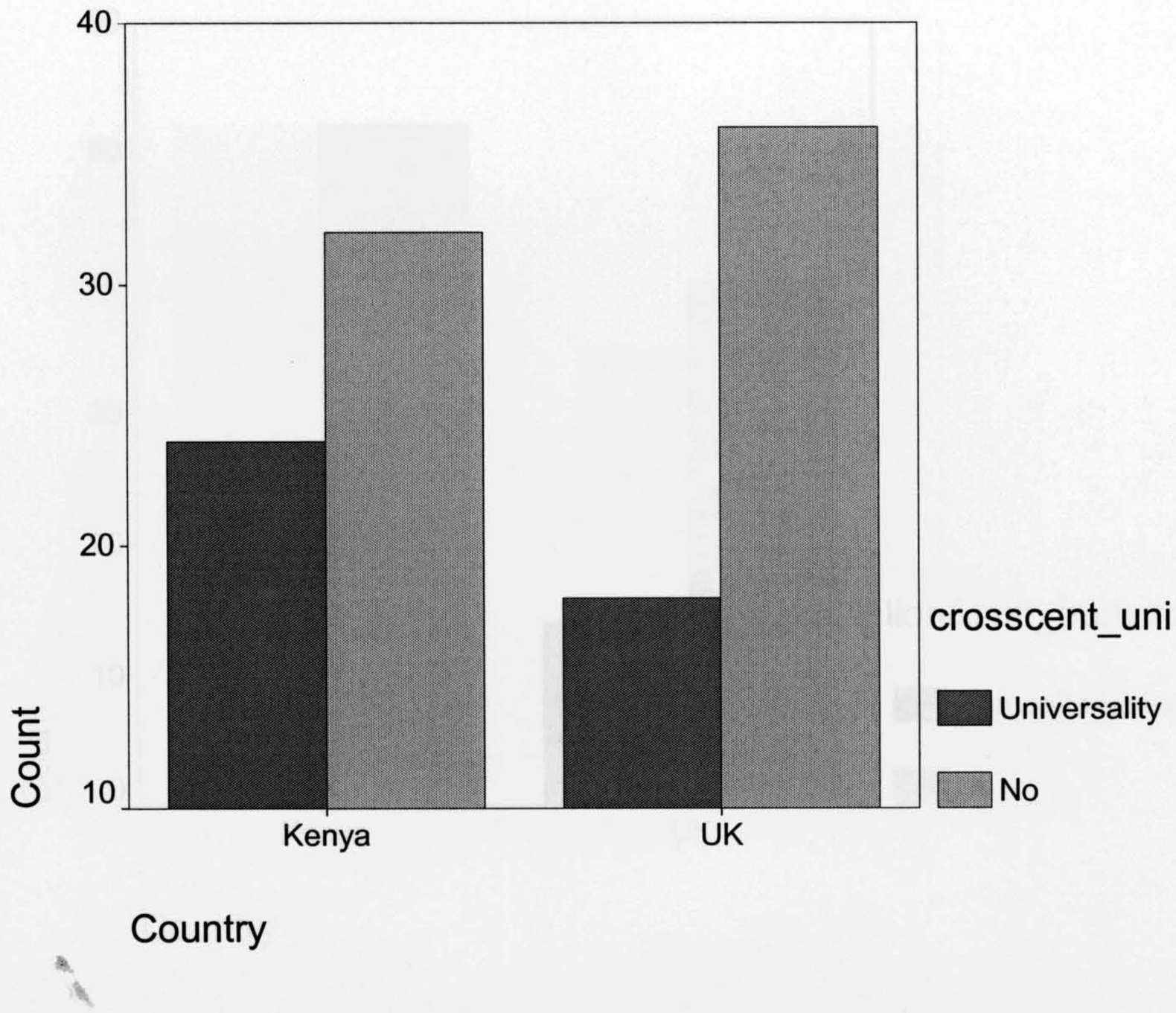
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.098	.095	1.023	.308[c]
Ordinal by Ordinal	Spearman Correlation	.098	.095	1.023	.308[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

			lion&sun_hum		Total
			Humanitarianism	No	
Country	Kenya	Count	4	52	56
		Expected Count	9.2	46.8	56.0
		% within Country	7.1%	92.9%	100.0%
	UK	Count	14	40	54
		Expected Count	8.8	45.2	54.0
		% within Country	25.9%	74.1%	100.0%
Total		Count	18	92	110
		Expected Count	18.0	92.0	110.0
		% within Country	16.4%	83.6%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	7.087[b]	1	.008		
Continuity Correction[a]	5.781	1	.016		
Likelihood Ratio	7.417	1	.006		
Fisher's Exact Test				.010	.007
Linear-by-Linear Association	7.022	1	.008		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.84.

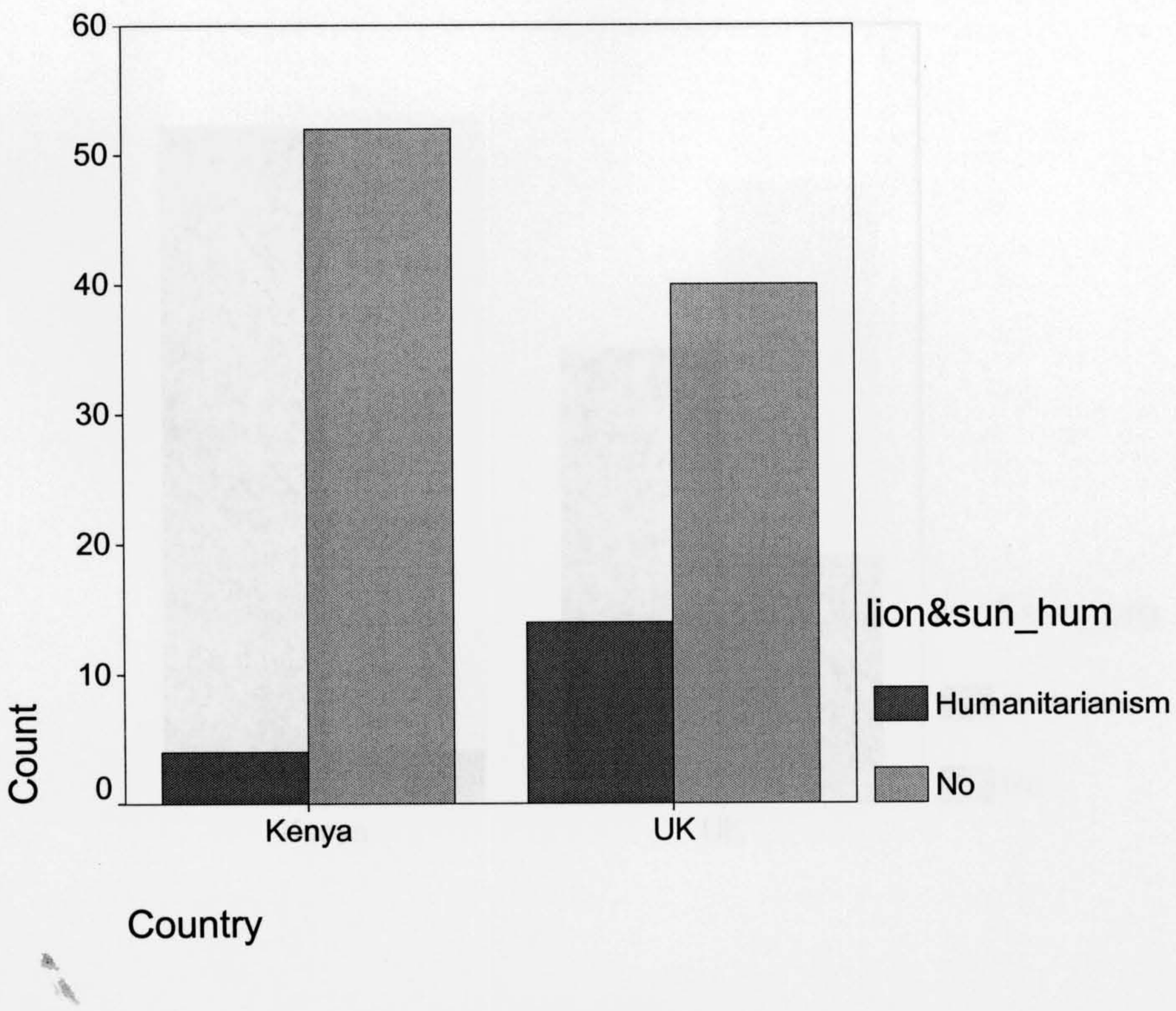
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	-.254	.085	-2.727	.007[c]
Ordinal by Ordinal	Spearman Correlation	-.254	.085	-2.727	.007[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

			lion&sun_pro		Total
			Protection	No	
Country	Kenya	Count	52	4	56
		Expected Count	44.3	11.7	56.0
		% within Country	92.9%	7.1%	100.0%
	UK	Count	35	19	54
		Expected Count	42.7	11.3	54.0
		% within Country	64.8%	35.2%	100.0%
Total		Count	87	23	110
		Expected Count	87.0	23.0	110.0
		% within Country	79.1%	20.9%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	13.072[b]	1	.000		
Continuity Correction[a]	11.432	1	.001		
Likelihood Ratio	13.938	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	12.954	1	.000		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.29.

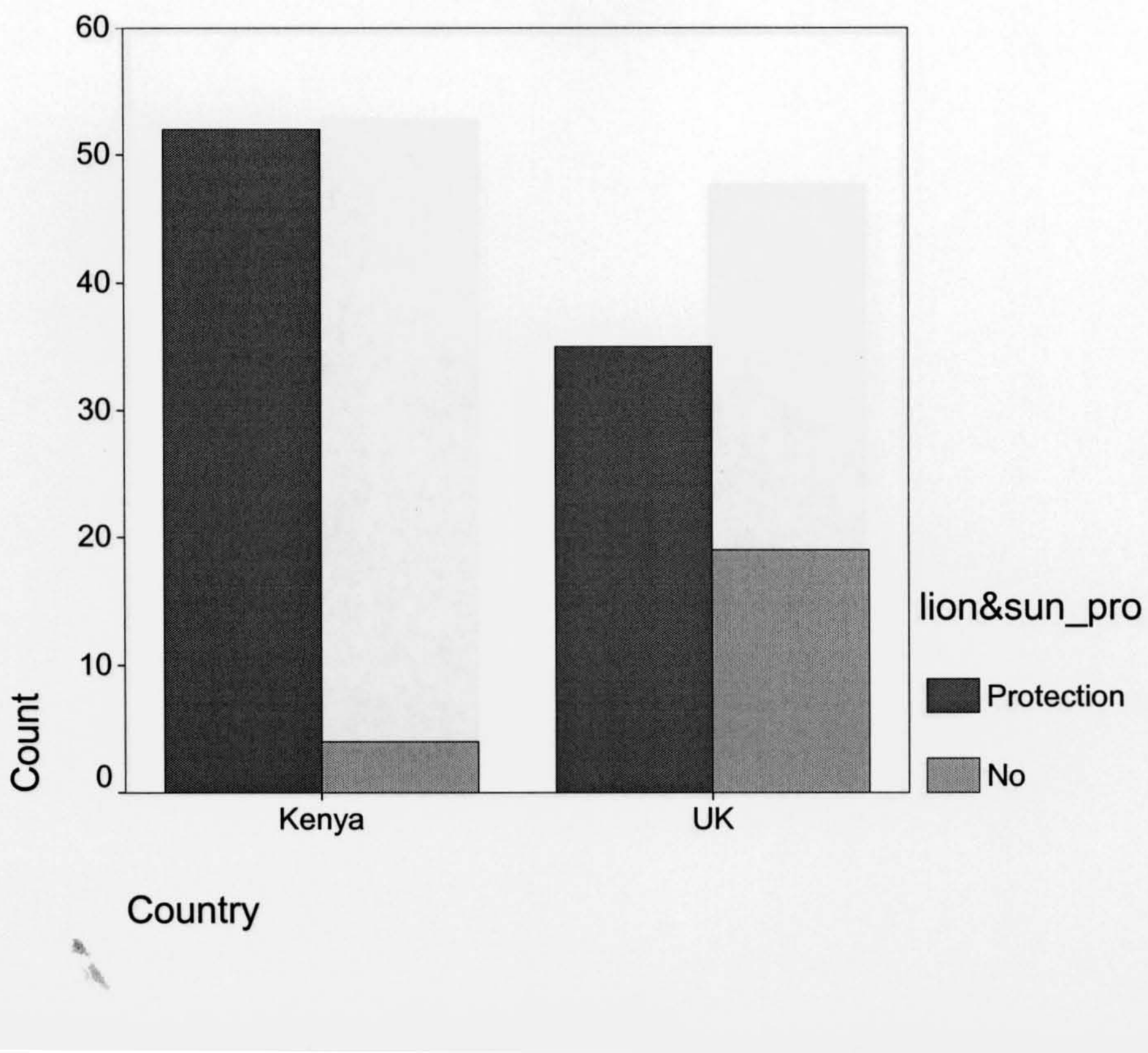
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.345	.081	3.817	.000[c]
Ordinal by Ordinal	Spearman Correlation	.345	.081	3.817	.000[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

			lion&sun_neu		Total
			Neutrality	No	
Country	Kenya	Count	3	53	56
		Expected Count	4.6	51.4	56.0
		% within Country	5.4%	94.6%	100.0%
	UK	Count	6	48	54
		Expected Count	4.4	49.6	54.0
		% within Country	11.1%	88.9%	100.0%
Total		Count	9	101	110
		Expected Count	9.0	101.0	110.0
		% within Country	8.2%	91.8%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.212[b]	1	.271		
Continuity Correction[a]	.567	1	.452		
Likelihood Ratio	1.231	1	.267		
Fisher's Exact Test				.316	.227
Linear-by-Linear Association	1.201	1	.273		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 4.42.

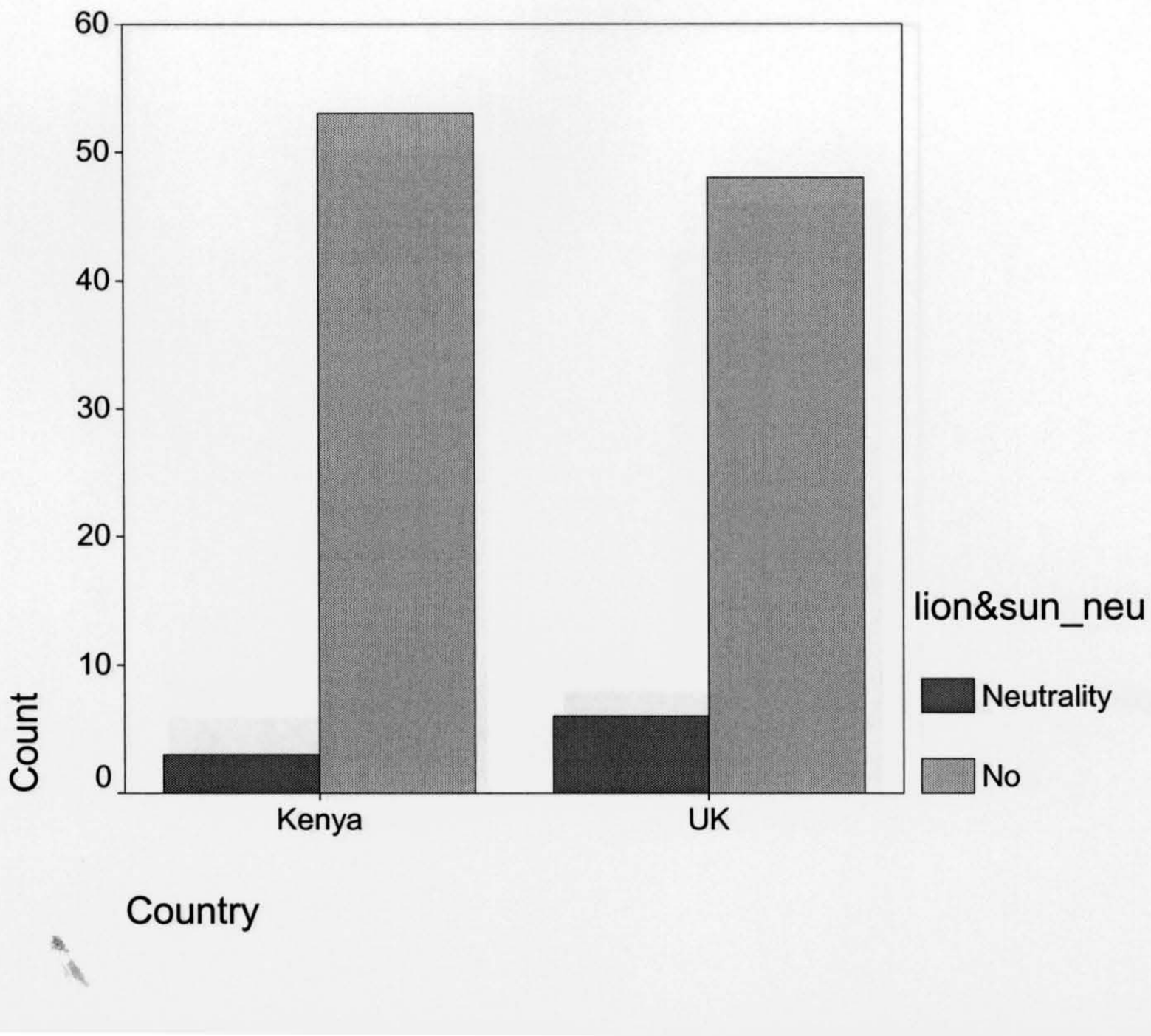
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	-.105	.092	-1.097	.275[c]
Ordinal by Ordinal	Spearman Correlation	-.105	.092	-1.097	.275[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

			lion&sun_uni		Total
			Universality	No	
Country	Kenya	Count	6	50	56
		Expected Count	7.1	48.9	56.0
		% within Country	10.7%	89.3%	100.0%
	UK	Count	8	46	54
		Expected Count	6.9	47.1	54.0
		% within Country	14.8%	85.2%	100.0%
Total		Count	14	96	110
		Expected Count	14.0	96.0	110.0
		% within Country	12.7%	87.3%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.416[b]	1	.519		
Continuity Correction[a]	.129	1	.720		
Likelihood Ratio	.417	1	.518		
Fisher's Exact Test				.577	.360
Linear-by-Linear Association	.412	1	.521		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.87.

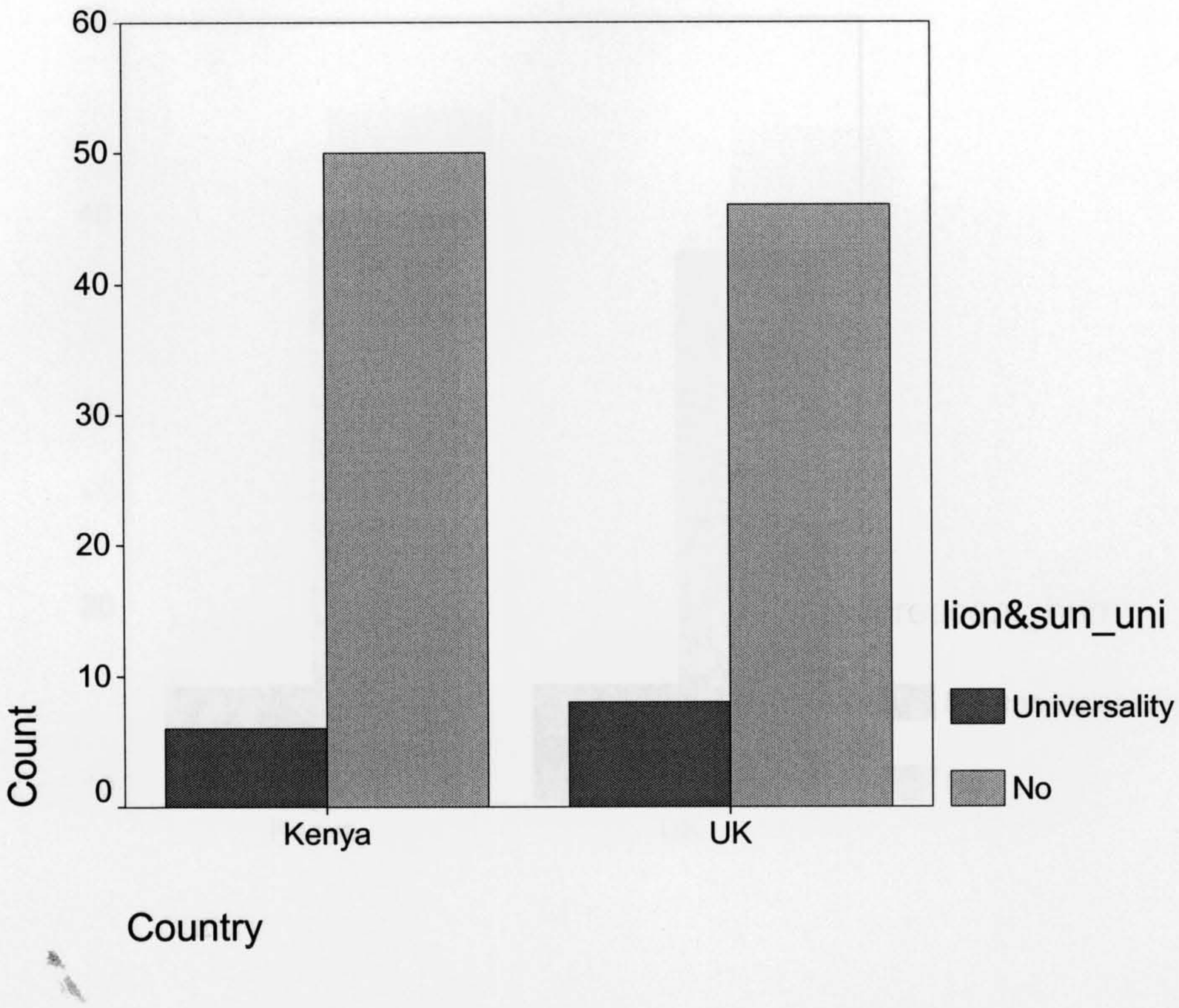
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	-.062	.095	-.640	.523[c]
Ordinal by Ordinal	Spearman Correlation	-.062	.095	-.640	.523[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

			crescent_hum		Total
			Humanitarianism	No	
Country	Kenya	Count	16	40	56
		Expected Count	16.3	39.7	56.0
		% within Country	28.6%	71.4%	100.0%
	UK	Count	16	38	54
		Expected Count	15.7	38.3	54.0
		% within Country	29.6%	70.4%	100.0%
Total		Count	32	78	110
		Expected Count	32.0	78.0	110.0
		% within Country	29.1%	70.9%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.015[b]	1	.903		
Continuity Correction[a]	.000	1	1.000		
Likelihood Ratio	.015	1	.903		
Fisher's Exact Test				1.000	.535
Linear-by-Linear Association	.015	1	.903		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 15.71.

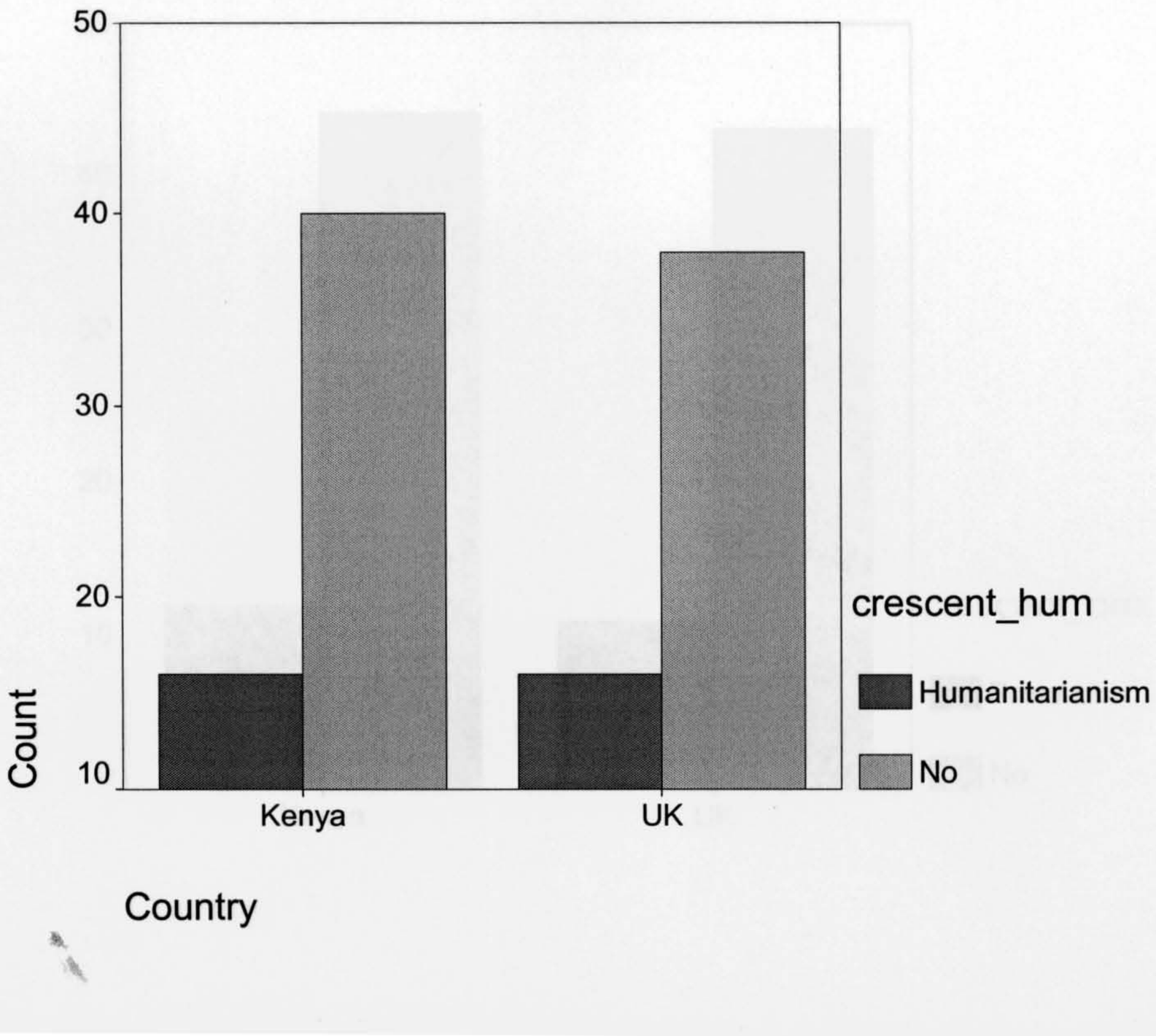
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	-.012	.095	-.121	.904[c]
Ordinal by Ordinal	Spearman Correlation	-.012	.095	-.121	.904[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

			crescent_pro		Total
			Protection	No	
Country	Kenya	Count	12	44	56
		Expected Count	11.7	44.3	56.0
		% within Country	21.4%	78.6%	100.0%
	UK	Count	11	43	54
		Expected Count	11.3	42.7	54.0
		% within Country	20.4%	79.6%	100.0%
Total		Count	23	87	110
		Expected Count	23.0	87.0	110.0
		% within Country	20.9%	79.1%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.019[b]	1	.891		
Continuity Correction[a]	.000	1	1.000		
Likelihood Ratio	.019	1	.891		
Fisher's Exact Test				1.000	.539
Linear-by-Linear Association	.018	1	.892		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.29.

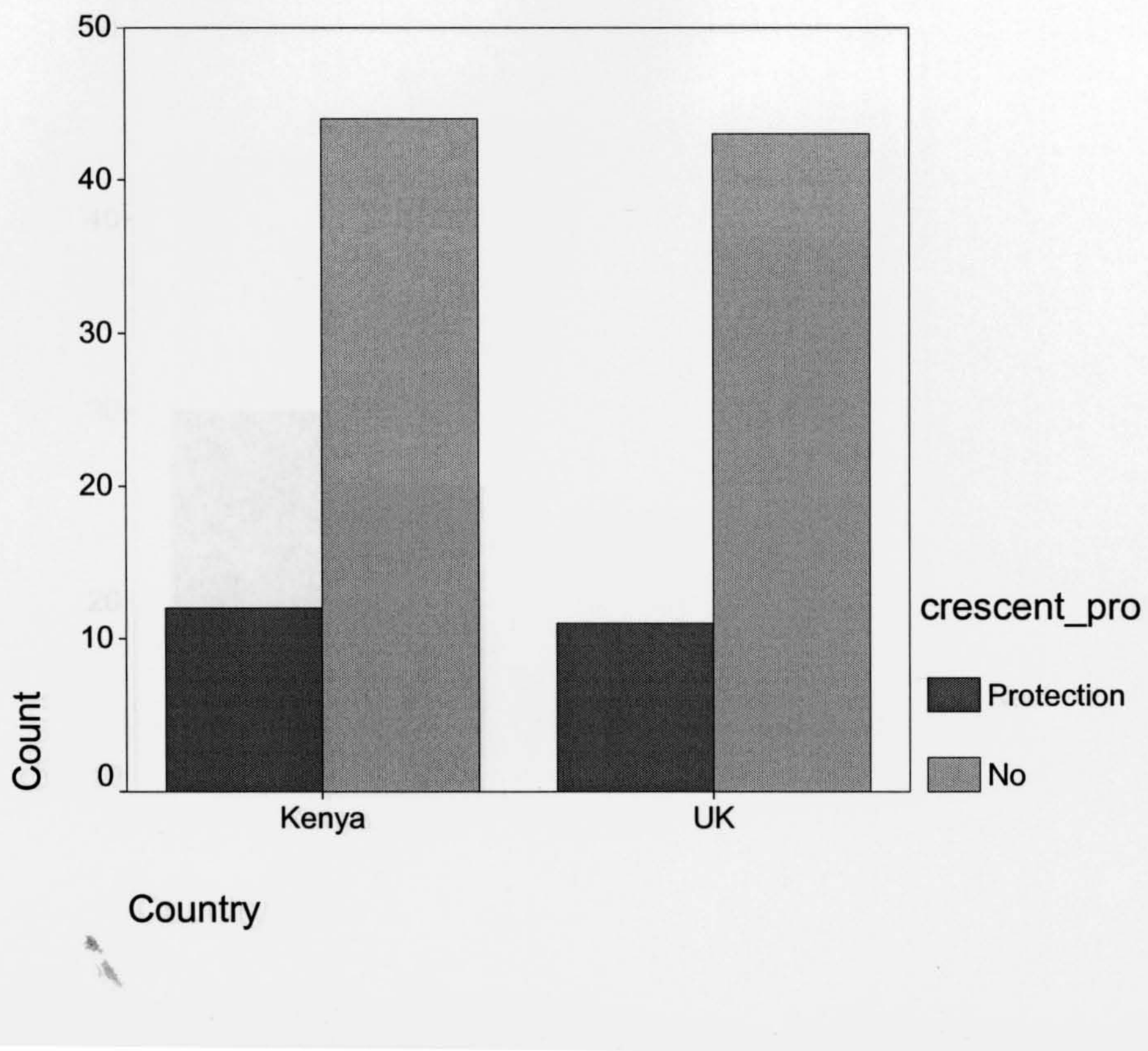
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.013	.095	.135	.893[c]
Ordinal by Ordinal	Spearman Correlation	.013	.095	.135	.893[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

			crescent_neu		Total
			Neutrality	No	
Country	Kenya	Count	30	26	56
		Expected Count	22.9	33.1	56.0
		% within Country	53.6%	46.4%	100.0%
	UK	Count	15	39	54
		Expected Count	22.1	31.9	54.0
		% within Country	27.8%	72.2%	100.0%
Total		Count	45	65	110
		Expected Count	45.0	65.0	110.0
		% within Country	40.9%	59.1%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	7.566[b]	1	.006		
Continuity Correction[a]	6.537	1	.011		
Likelihood Ratio	7.678	1	.006		
Fisher's Exact Test				.007	.005
Linear-by-Linear Association	7.497	1	.006		
N of Valid Cases	110				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 22.09.

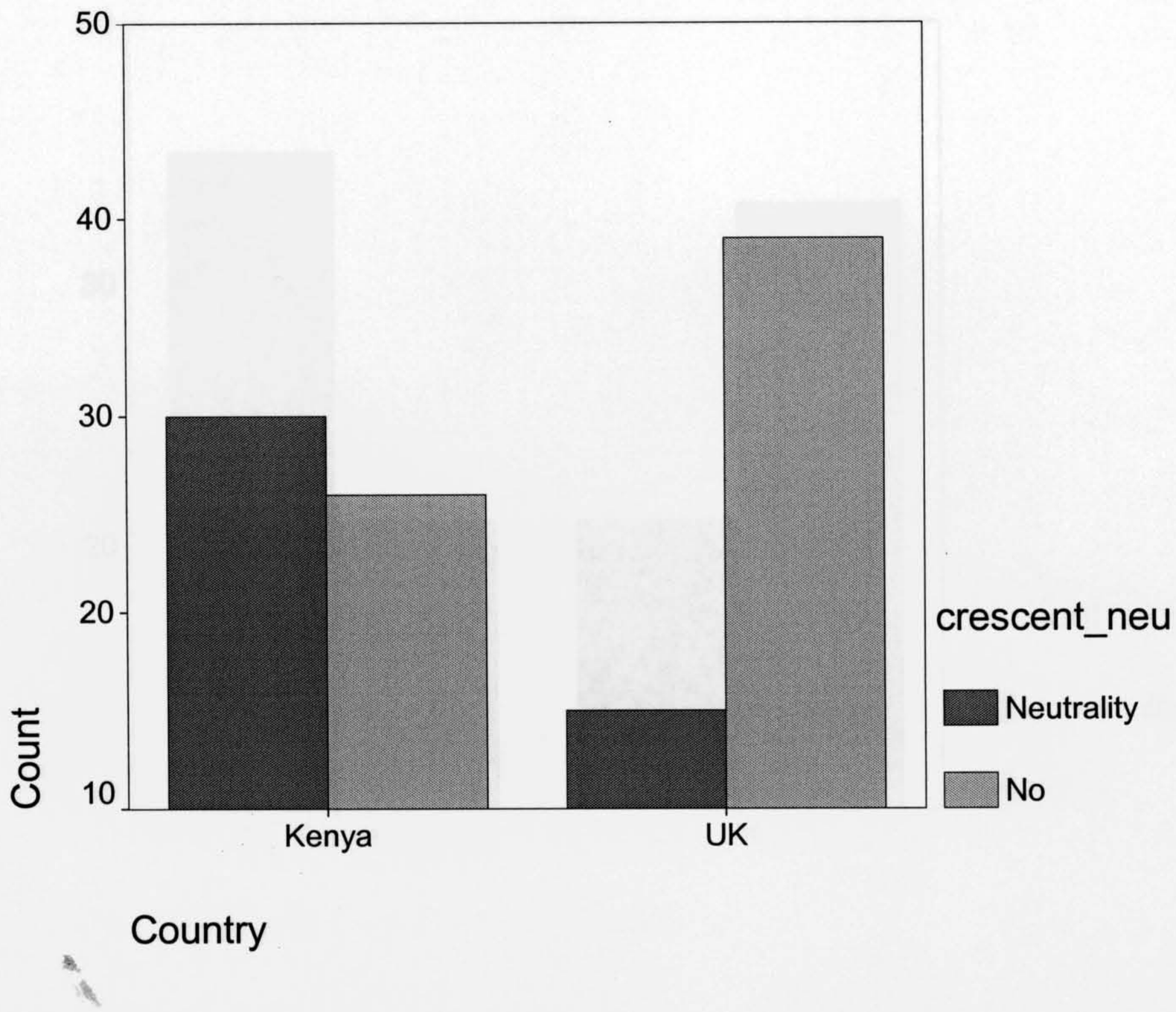
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.262	.091	2.824	.006[c]
Ordinal by Ordinal	Spearman Correlation	.262	.091	2.824	.006[c]
N of Valid Cases		110			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Appendix XIII: Information Design Journal article

The graphical forms, visual-verbal resonances, meanings, and semiosis of the Red Cross symbols: implications for symbol-type decisions

Havi Murungi (corresponding author: havi@dmu.ac.uk), Ian McLaren, Robert Chen

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Abstract

We investigated the semiosis of pictorial, schematic, and abstract symbols using current and proposed emblems for the International Red Cross and Red Crescent Movement. Cross-cultural symbol-referent ratings of correspondence suggested the symbols could all be considered icons and indexes of the referents. Mean comprehensibility estimation scores differed significantly between familiar and unfamiliar symbols. Pictorial graphical form and symbol familiarity did not appear to constrain interpretations in the open-ended comprehension test. Thus at the referent denotation level, the symbols appeared to be simultaneously iconic and indexical, and at the symbol interpretation level, they appeared to be simultaneously iconic and symbolic. The findings suggest that symbol semiosis, rather than graphical form, is a more practical method for deciding the type of symbol one would use to communicate specific types of messages.

Key words

Graphical form, Red Cross/Crescent, referent, semiotics, symbol design, visual communication

About the authors

Havi Murungi is a Ph.D. student in the Faculty of Art and Design, De Montfort University, UK. He received his M.A. (Information Design) from De Montfort University, Leicester (1996) and B.A. (Graphic Design) from the University of Nairobi, Kenya (1987). He was previously a university lecturer and market researcher in Kenya. This paper is derived from his thesis.

Ian McLaren is Research Professor in Design at De Montfort University, Leicester, responsible for research and consultancy across Art, Design, and Architecture. He has worked on projects such as the 20th Olympiad, Munich; exhibitions for UNESCO and the Centre Pompidou; the user interface for the French 'Minitel' electronic telephone directory; signing of the Lyon Métro; studies for the European Commission on videotext; and requirements of the visually handicapped in the métros of Brussels, London and Paris.

Dr. Robert Chen received his Ph.D. from King's College, University of London (1993), M.Phil. from De Montfort University, Leicester (1991), and B.Sc. from the National Cheng-kung University, Tainan, Taiwan (1980). He is a Principal Lecturer and the Course Leader of the M.A./M.Sc. Design and Manufacture Programme at De Montfort University, Leicester.

1 Introduction

1.1 Background

The Red Cross was proposed as the emblem for the International Red Cross and Red Crescent Movement (the movement[1]) at its founding in Geneva in 1863; the Ottoman Empire opted to use the Red Crescent in place of the Red Cross during the Russo-Turkish war of 1876-1878 (Bugnion, 2000: 7-12), a decision not devoid of religious, cultural, and political overtones (Kosuge, 2003: 75-76). The Red Crescent, and Red Lion and Sun, the latter used by Persia and its successor Iran until 1980, were recognised as additional official emblems in 1929 (Bugnion, 2000: 13-18). A new emblem, 'the red crystal', (Forster, 2001: 1159) was developed to avoid the religious connotations of the Cross and Crescent (see Bugnion, 1977, 2000; Kosuge, 2003; Sommaruga, 1992).

Figure 1: The Red Cross, Red Crescent, and Red Lion and Sun, the official emblems of the International Red Cross and Red Crescent Movement, and the new proposal, the Red Crystal.

The Red Crystal (Figure 1) is conceived as a compound symbol within which National Societies that have reservations about using the official emblems can place their devices (International Committee of the Red Cross, 2000: 2-3), for example, the Israeli Red Shield of David (Magen David Adom). In effect the movement, in spite of its name, has a potentially indefinite configuration of visual representations. The unique and principal work of the movement, that of offering assistance to the victims of war, including combatants, with the implicit demands for neutrality and visibility that this entails, makes this lack of visual coherency an unacceptably confusing and potentially dangerous situation.

1.2 Research objectives

1.2.1 Abstract symbols are devoid of 'pre-existing connotations'

A review of several authors (Arnheim, 1970; Blackwell & Engelhardt, 2002; Dondis, 1973; Eliot, 1960; Familant & Detweiler, 1993; Frutiger, 1989; Hakiel & Easterby, 1984; Kazmierczak, 2000/2001; Krampen, 1965; Modley, 1966; Moriarty, 1985; Richards, 2000) indicates that the current emblems may be classified as "pictorial" and the proposed symbol "abstract" (Table 2). This suggests a deliberate attempt to adopt the abstract on this occasion, presumably to avoid the unhelpful connotations engendered by the current pictorial symbols. Indeed, Foster[2] has suggested that 'tests will demonstrate that [abstract symbols have] no prior meaning ... establish[ing] that one is starting with a "clean" symbol with no pre-existing connotations'. The implicit assumption is that abstract symbols, unlike their pictorial alternatives, are devoid of 'pre-existing connotations'. The pictorial-to-abstract characteristics of the current and proposed symbols presented an ideal situation to test this proposition.

1.2.2 Design methods to constrain symbol interpretation

Firth, an anthropologist, wrote: 'If a symbol is to be an effective instrument of communication, it is essential that it should convey much the same thing to [the] people involved ... [and] the range of variation in their interpretations should not inhibit the action desired' (Firth, 1973: 81). Inserting the words *graphical* before 'symbol' and *visual* before 'communication' makes this observation relevant to this study. Thus, to paraphrase Firth, if a graphical symbol is to be an effective instrument of visual communication, it is essential that it should convey much the same thing to users, and the range of variation in user interpretations should not inhibit the action desired, *nor should the symbol design, in and of itself, inhibit communication by its failure to constrain extraneous interpretations.* Another aspect under investigation therefore was the notion of constraining and/or re-orienting symbol interpretations through symbol design.

1.2.3 Alternative proposals

With a view to determining the most suitable symbol for the movement, we evaluated current emblems and new designs. Suitability was based on a demonstrable ability to denote the movement's core attributes (see section 2.1 below); comprehensibility and meaningfulness in relation to these attributes; frequency of unhelpful interpretations, e.g., religious, ethnic, or political connotations; and a set of criteria proposed by the International Committee of the Red Cross (see Bugnion, 2000: 32-33).

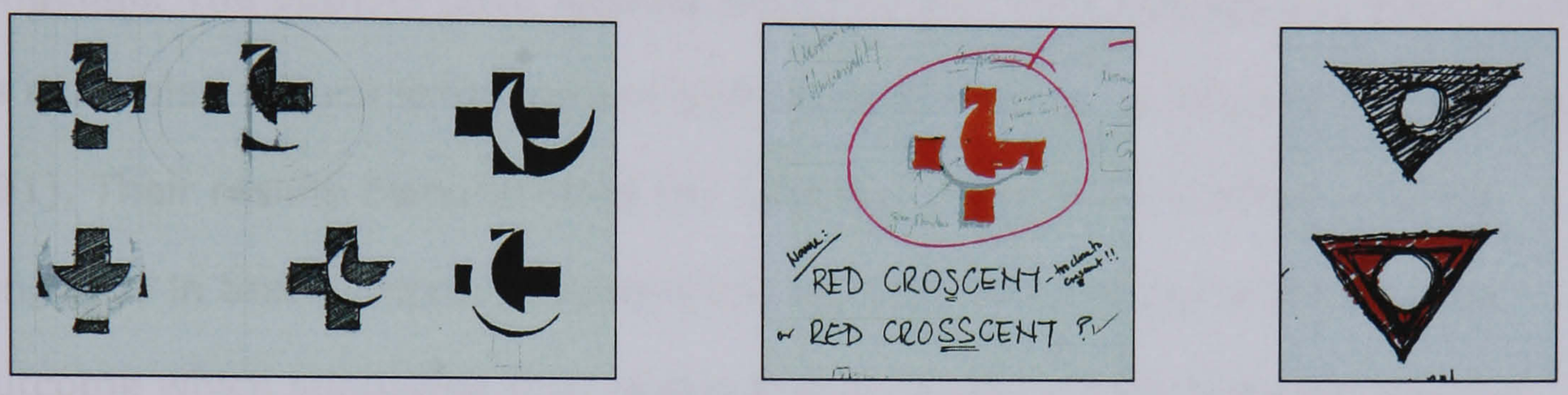

Figure 2: Sketches and suggested name for the Crosscent (left and centre), and visualisation of Heart proposal (right), by Havi Murungi.

Two symbols were included in the test material additional to the four in Figure 1 (Figure 2). The composite Crosscent, designed by the first author, was introduced to test the notion of constraining symbol interpretation and/or re-orienting symbol meaning by simply combining the Cross and Crescent emblems. The Heart was based on a proposal put forward by the Netherlands at a Diplomatic Conference held in Geneva in 1949. This was one of several meetings which have over the years attempted to resolve the symbol issue (see Bugnion, 1977); the Netherlands delegate 'suggested that the sign might be a stylized red heart in the form of an inverted equilateral triangle' (p. 40).

1.2.4 Utility of ISO 9186: 2001 outside its original context

In response to the issues of comprehensibility, meaningfulness, and negative connotations, two of the four studies reported here were based on ISO 9186: 2001. The procedures (see International Organisation for Standardisation, 2001) were

'initially designed to apply to public information and safety signs' (Foster, 2001: 13). The test symbols do not fall within the domain of public information or safety symbology. This study therefore assessed for the first time ISO 9186's utility outside its original context.

1.3 Symbol semiosis

In a study aimed at, among other things, improving instructional text design (e.g., school textbooks), Sadoski et al. (1993) experimented with concrete and abstract language. The authors gave 'slender ballerina' and 'valid hypothesis', respectively, as examples of such language and defined concreteness as 'ease of imagery' (p. 291). Their results demonstrated the cognitive effect of embedding concrete language in text – improved understanding and memorability of the text, an outcome which supported dual coding theory (p. 301). They suggest concrete language embeds imagery engendered by the textual material in reader's minds more efficiently than abstract language.

Theoretically then, concrete referents, i.e., the 'idea or object that the graphical symbol is intended to represent' (International Organisation for Standardisation, 2001: part 3.8), should be resonant with pictorial (iconic) symbols, if only because this class of symbols encapsulates the notion of 'ease of imagery'. The same should hold true of abstract referents and abstract (symbolic) symbols, notwithstanding the logically converse "difficulty of imagery" of abstract language.

Krampen (1983) lends credence to this proposition; he developed, over a series of empirical investigations, several criteria for classifying iconic, indexical, and symbolic signs (Table 1). Specifically, the criteria for iconicity and symbolicity are consistent with our conceptual pictorial and abstract symbol semiosis.

Iconicity *[Visual analogue]*	**Indexicality** *[Observable consequence]*	**Symbolicity** *[Convention/agreement]*
[The symbol] resembles what it stands for	[The symbol] is meant to point at something definite	[The symbol] has been arbitrarily set for what it stands for
[The symbol] represents something real as an image	[The symbol] is meant to indicate a direction	[The symbol] has its meaning by virtue of convention
[The symbol] and what it stands for have many characteristics in common	[The symbol] is meant to serve as orientation	[The symbol] is understandable only if one has learned its meaning beforehand

Table 1: Semiotic dimensions, characteristics, and evaluation criteria (adapted from Krampen, 1983).

However, Moriarty (1994)[3] observed that: 'Symbols are arbitrary, but icons and indexes are ... "motivated", that is they are more likely to resemble their object in some way, rather than being arbitrary' (p. 1). Thus, Moriarty extends our pictorial expectation to indexical signs, a clarification which appears to resolve Smith's (1986: 201) doubts about the existence of indexical graphic images, the origin of the uncertainty being Peirce's triadic sign theories and the aspect of causality with respect to indexical signs (see Cobley & Jansz, 1997; Hoopes, 1991; Sless, 1986). If we accept Moriarty's (1994) view in the interim, we are still left with the question, are these delineations discernible in graphic symbology? If so, do they hold true at all levels of visual discourse, e.g., at the referent denotation and symbol interpretation levels?

2 Methodology

2.1 Symbol classification and referent denotation

The six test symbols were classified according to descriptions of visual representations, or 'modes of depiction' (Richards, 2000: 97), proposed by previous authors (Table 2). A procedure adapted from Young and Wogalter (2000/2001) was carried out to rate the correspondence between the symbols and the movement's core attributes. These attributes, identified from documents detailing the work and ideals of the movement (International Committee of the Red Cross, 1996, 1997, 1998), were 'humanitarianism', 'protection', 'neutrality', and 'universality'. The terms "attribute" and "referent" are used interchangeably here.

Source	Characterisation of visual representations		
Arnheim (1970: 151)	Replica	Stylised	Non-mimetic
Blackwell and Engelhardt (2002: 4)	Realistic	Schematic	Abstract
Dondis (1973: 67)	Representational	Abstract/Kinesthetic	Symbolic/Arbitrary
Eliot (1960: 50, 53)	Pictorial	-	Abstract
Familant and Detweiler (1993: 711)	Iconic	-	Symbolic
Frutiger (1989: 348-349)	Naturalistic	Schematised	Abstract
Hakiel and Easterby (1984: 424)	Pictographic	-	Symbolic
Kazmierczak (2000/2001: 176)	Imitational	-	Diagrammatic
Krampen (1965: 12)	Pictograph	-	Diagram
Modley (1966: 115)	Image-related	Concept-related	Arbitrary
Moriarty (1985: 3)	Literal	-	Symbolic
Richards (2000: 97)	Figurative	Semi-figurative	Non-figurative
Classification of test symbols	*Pictorial*	*Schematic*	*Abstract*

Table 2: Classification of the test material employing categories proposed by previous authors. The symbols were (from left) Lion and Sun, Cross, Crescent, Crosscent, Heart, and Crystal.

2.2 Symbol comprehensibility and symbol meaning

A comprehensibility judgement test based on ISO 9186: 2001 evaluated the degree of understandability of the symbols when proposed as visual representations of the referent-attributes. An open-ended comprehension test (op. cit.) indicated what the symbols actually meant to participants.

3 Procedures

3.1 Studies 1 and 2

Two correspondence rating studies were carried out. Participants in Kenya were recruited from randomly selected households in five urban areas across the country (Nairobi, Mombasa, Kisumu, Nakuru, and Nyeri) while a multi-cultural design

student cohort on the M.A./M.Sc. Design and Manufacture programme at De Montfort University, Leicester, comprised the UK sample (Tables 3 and 4).

		Frequency	Percent
Age	15-30	28	50.0
	31-50	21	37.5
	51+	7	12.5
	Total	**56**	**100.0**
Gender	Male	36	64.3
	Female	20	35.7
Education	Secondary	23	41.1
	Technical/College	23	41.1
	University	10	17.9
Ethnicity	Black African	51	91.1
	Indian	3	5.4
	Arabic	1	1.8
	White	1	1.8
Religious group	Muslim	9	16.1
	Christian	44	78.6
	Hindu	2	3.6
	None	1	1.8

Table 3: Characteristics of participants in study 1 (Kenya)

		Frequency	Percent
Age	15-30	47	87.0
	31-50	7	13.0
	Total	**54**	**100.0**
Gender	Male	24	44.4
	Female	30	55.6
Education	University	54	100.0
Ethnicity	Black African	2	3.7
	Indian	2	3.7
	Arabic	1	1.9
	Asian	3	5.6
	White	12	22.0
	Taiwanese	16	29.6
	Korean	1	1.9
	Chinese	11	20.4
	Bangladeshi	3	5.6
	Thai	1	1.9
	Pakistani	2	3.7
Religious group	Muslim	5	9.3
	Christian	10	18.5
	Hindu	3	5.6
	Buddhist	5	9.3
	Other	1	1.9
	None	15	27.8
	Not indicated	15	27.8

Table 4: Characteristics of participants in study 2 (UK)

The six symbols were placed in a circle on one side of an A4 single-sheet questionnaire. The four attributes (humanitarianism, protection, neutrality, and universality, numbered 1 to 4 respectively) were proposed as the alternative "ideas" or "objects" which the symbols represented. The numbered attributes substituted the numeric rating scale used by Young and Wogalter (2000/2001:

129). Respondents rated symbol-attribute correspondence by encircling the equivalent number(s) above each symbol. Multiple answers were admissible for each symbol. Lack of correspondence was indicated by not marking any number or by encircling a fifth option, "none of these".

3.2 Study 3

The comprehensibility judgement test was carried out in Kenya. A different set of participants was recruited from randomly selected households in the five urban areas detailed in section 3.1. Participant recruitment for study 3 began at the point of termination of recruitment for study 1; hence there was little likelihood of any respondent taking part in both studies.

An A4 single-sheet questionnaire bearing the six symbols placed in a circle and one of the four attributes was presented to each participant (hence separate samples evaluated each attribute against the six symbols). Participants were required to write down the percentage of the population which they expected would understand the meaning of each symbol if it represented visually the attribute, giving 0% if they thought no-one would understand, 100% if they thought everyone would understand, with any estimates in-between. 57 humanitarianism, 60 protection, 57 neutrality, and 59 universality questionnaires were completed (n=233).

3.3 Study 4

The comprehension test was also carried out in Kenya. The 20 participants were members of staff of a market research agency in Nairobi. They were asked to examine each of the six symbols on the A4 single-sheet questionnaire and write down what they thought it meant, or 'don't know' if they could not assign a meaning to the symbol. Multiple answers were admissible for each symbol.

4 Results and analysis

4.1 Correspondence rating (studies 1 and 2)

A Chi-Square test indicated significant association between symbols and attributes. The cross-tabulation comprised the 6 symbols x the 5 options (4 attributes plus "none of these"). Results for study 1 (Kenya) were: χ^2=203.405; df=20; p<0.001; and for study 2 (UK): χ^2=80.639; df=20; p<0.001. Correlation between the two studies was significant: r_S=0.693; n=30; p<0.01. Most frequent symbol-attribute ratings of correspondence are emboldened in column 3 and 4 in Table 5.

Symbol	**Studies 1&2** Correspondence rating	**Kenya (n=56)** % of responses	**UK (n=54)** % of responses	**Study 3** Comprehensibility judgement test	**Kenya (n=233)** % of population
Crystal	Humanitarianism	6.8	10.3	Humanitarianism	30.5
	Protection	16.2	26.5	Protection	27.9
	Neutrality	**48.6**	**27.9**	Neutrality	35.4
	Universality	21.6	23.5	Universality	36.4
	None of these	6.8	11.8	**Mean**	**32.6**
Cross	*Humanitarianism*	**37.1**	30.9	Humanitarianism	81.1
	*Protection*	30.7	**34.0**	Protection	78.1
	Neutrality	14.3	18.1	Neutrality	77.0
	Universality	17.9	17.0	Universality	78.0
	None of these	0.0	0.0	**Mean**	**78.6**
Heart	Humanitarianism	12.2	3.3	Humanitarianism	39.8
	Protection	26.8	25.0	Protection	33.4
	Neutrality	**31.7**	**30.0**	Neutrality	36.9
	Universality	28.0	20.0	Universality	39.8
	None of these	1.2	21.7	**Mean**	**37.5**
Crosscent	Humanitarianism	5.1	17.2	Humanitarianism	34.5
	Protection	12.8	17.2	Protection	31.5
	Neutrality	**47.4**	14.1	Neutrality	35.9
	Universality	30.8	**28.1**	Universality	34.2
	None of these	3.8	23.4	**Mean**	**34.0**
Lion and Sun	Humanitarianism	6.0	20.0	Humanitarianism	25.1
	**Protection**	**77.6**	**50.0**	Protection	46.7
	Neutrality	4.5	8.6	Neutrality	36.5
	Universality	9.0	11.4	Universality	31.7
	None of these	3.0	10.0	**Mean**	**35.0**
Crescent	Humanitarianism	17.2	22.5	Humanitarianism	50.5
	Protection	12.9	15.5	Protection	49.3
	Neutrality	32.3	21.1	Neutrality	56.1
	Universality	**37.6**	**29.6**	Universality	53.5
	None of these	0.0	11.3	**Mean**	**52.3**

Table 5: Summary of results from studies 1, 2, and 3.

The most frequent and second most frequent ratings of correspondence for the Cross were reversed across samples. In Kenya these were humanitarianism and protection, and in the UK protection and humanitarianism, respectively. It could be argued that the Cross corresponded with both attributes. This is an unsurprising outcome given the Cross' religious association and the affiliation it has had with the movement which bears its name (both of these were confirmed in study 4; see Table 6).

In the case of the Crosscent, the most frequent rating of correspondence in Kenya was with neutrality; the UK sample rated the symbol as corresponding *least* with this attribute. The second most frequent rating of correspondence in Kenya was with universality; the UK sample rated the symbol as corresponding *most* with this attribute. It could be argued that there was greater agreement between samples concerning the universality attribute, the more so when one considers that the second-most frequent rating of correspondence by the UK sample was "none of these".

4.2 Comprehensibility judgement test (study 3)

4.2.1 Pilot study

A pilot study (n=18) using separate questionnaires with red-on-white and black-on-white symbols indicated that comprehensibility estimates for the red-on-white Cross, in comparison to a black-on-white version, went up 16% (mean of 69.1% to 85.1%). Comparable figures for the red-on-white Crescent were up 1% (27.2% to 28.4%); red-on-white Crosscent down 3% (19.0% to 16.3%); and red-on-white Crystal up 9% (12.8% to 22.1%). It was clear that the red colour had a disproportionate effect on judgements of comprehensibility, especially with regard to the Cross. Black-on-white symbols were used throughout this investigation as recommended in ISO 9186: 2001.

4.2.2 Main study

Data from the main study (n=233) were analysed using a repeated measures ANOVA. The test of within-subjects effects (symbols) was significant: $F(5,1145)=134.437$; $p<0.05$; interaction between symbols and attributes was also significant: $F(15,1145)=2.427$; $p<0.05$; however, the test of between-subjects effects (attributes) was not significant: $F(1,229)=0.408$; $p=0.748$. In other words, comprehensibility estimates differed significantly between symbols but not between attributes.

Correlation between the comprehensibility judgement test (carried out only in Kenya) and the Kenya correspondence rating test was barely significant ($r_S=0.417$; $n=24$; $p=0.042$); correlation between the judgment test and the UK correspondence rating test was not significant ($r_S=0.274$; $n=24$; $p=0.195$).

Pairwise comparisons of main study 3 data indicated that mean comprehensibility estimates between the Cross and Crescent differed significantly ($p<0.05$); mean scores between these two symbols and the other four (Crystal, Heart, Crosscent, and Lion and Sun) differed significantly also ($p<0.05$); however, mean scores between these latter set did not differ significantly ($p=0.088$ to $p=1.000$). That notwithstanding, the mean scores provided a measure of symbol comprehensibility: the Cross and Crescent in 1st and 2nd position and the other four symbols all at 3rd due to their statistically indistinguishable scores (Table 6).

4.3 Comprehension test (study 4)

The total number of responses in the comprehension test, including identical or similar answers, was 141 (n=20). This represented 68 different "meanings" across the six symbols, an average of 11.3 per symbol. Differences in average number of "meanings" between the (initial) graphical form classifications were negligible – 12.3 "meanings" across the pictorial and 10.3 across the schematic/abstract

categories (Table 6). The same was the case between familiar and unfamiliar symbols – 11.5 "meanings" (between the Cross and Crescent) and 11.25 (the rest). Responses which could be termed "correct" with respect to the movement's attributes and criteria proposed by the ICRC are emboldened in Table 6.

5 Discussion

5.1 Pre-existing connotations

If we construe the symbols as the 'material aspect' of, and the attributes as the 'mental concept' engendered by the symbols (cf. Cobley & Jansz, 1997: 10-13), the symbol-attribute correspondences in studies 1 and 2 represent a close approximation of Saussure's 'signifier-signified' dyad. This implies the symbol set was not devoid of pre-existing connotations if we interpret the correspondences as connotations. Further, given the pictorial-to-abstract characteristics of the symbols and the concrete-to-abstract language of the attributes, the symbol-attribute couplings do not appear to be arbitrary. This validates Moriarty's (1994) assertion that '… arbitrariness [between signifier and signified as conceptualised by Saussure] is true in most spoken and written language … however, that may not be so for other types of signs such as visuals that provide stylized cues to stimulate recognition through resemblance' (p. 1). 'Stylized cues' is interpreted here as "graphical form".

Symbol familiarity apparently informed judgments of comprehensibility (study 3). The Cross and Crescent are familiar symbols in Kenya. Respondents may have judged these symbols more comprehensible than the others for this reason, ignoring, as it were, the symbol-referent correspondences established in studies 1 and 2. This may explain the respective significant and non-significant differences between symbols and between attributes in study 3, and also the barely significant and non-significant correlations between studies 1 and 3, and between studies 2 and 3 (see section 4.2.2 above).

Test symbols	Lion and Sun 	Cross 	Crescent 	Crosscent 	Heart 	Crystal 
Re-classification	*Pictorial*		*Schematic/Abstract*			
Studies 1 and 2 Correspondence rating (n=110) *'The idea or object represented…'*	*Protection*	*Protection / Humanitarianism*	*Universality*	*Universality*	*Neutrality*	*Neutrality*
Semantic polarity of referent-attributes	*Concrete*					*Abstract*
Symbol semiosis at the denotative level	*Simultaneously and indivisibly indexical and iconic*					
Study 3 Mean comprehensibility estimate (% of pop.) and rank* (n=233)	35.0% **3**	78.6% **1**	52.3% **2**	34.0% **3**	37.5% **3**	32.6% **3**
Study 4 Comprehension test (n=20) *'What do you think this symbol means?'* Most frequent responses (top down)	Rastafarian Brave/ Tough/ Strong **Protection** Fight/ Conquer Freedom	**Red Cross** **Relief/ Aid/Help** Death/ Sorrow Church/ Religion **Humanity/ Life**	Islam/ Mosque Calm/ Cool/ Quiet Don't know Eclipse	Don't know **Unity/ Union** (between Cross & Crescent/ Christianity & Islam)	Road sign/ Traffic/ Stop/ Danger/ No parking Don't know Centre/ Focussed	Don't know Diversion/ Sharp corner ahead Closed up/ Imprisoned
"Meanings" per symbol	**14**	**9**	**14**	**9**	**11**	**11**
Symbol semiosis at the interpretive level and relative proportions	*Iconic > Symbolic*	*Symbolic >Iconic*	*Symbolic >Iconic*	*Symbolic =Iconic =Indexical*	*Symbolic >Iconic*	*Symbolic =Iconic*

**Mean comprehensibility estimates of similarly ranked symbols (study 3) were statistically indistinguishable (p>0.05).*

Table 6: Summary of research results (n=363).

Results from study 4 provided further evidence that abstract symbols were not devoid of pre-existing connotations. One may argue that the shape of the Heart and Crystal are unfortunate in that they resemble European and American road traffic warning signs, respectively. (This explains the traffic-signing connotations; however, while the triangular shape is employed in Kenya, the diamond is not). Nonetheless, the same argument would apply to the Cross and the Crescent and their religious connotations. The Cross suffers also from an unfortunate name – it is

likely a different history would have unfolded had it been named the "Red Plus" (in which case it would have been classified in this study as an abstract symbol).

5.2 Symbol semiosis and symbol re-classification

The 'centre/focussed' responses to the Heart and 'closed up/imprisoned' responses to the Crystal in study 4 appear to be iconic readings of these abstract symbols, similar in this respect to, for example, 'fight/conquer' (Lion and Sun), 'Red Cross' (Cross, despite a black-on-white symbol), and 'eclipse' (Crescent) (refer to Table 1). However, other responses to these symbols suggest they were interpreted symbolically also, viz. the traffic signing messages, 'Rastafarian', 'relief/aid/help', and 'Islam/mosque', respectively. Hence symbol semiosis was not exclusively pictorial-iconic and abstract-symbolic.

The Crescent appears to belong to the schematic/abstract graphical category – it corresponded with an abstract attribute (universality), engendered mainly symbolic connotations in study 4, and was the only symbol classified initially as "pictorial" which generated "don't know" responses.

5.3 The most suitable symbol and the utility of ISO 9186: 2001

It is apparent that the Cross possessed – or has over time taken on – iconic and symbolic connotations relevant to the movement. However, results from study 4 confirm that both the Cross and Crescent have religious connotations. The Lion and Sun, and Heart and Crystal have unhelpful connotations of a political-cultural and road traffic signing nature, respectively.

The Crosscent's 'unity/union' connotations are not unhelpful. For one, they indicate that the composite cross-and-crescent design re-oriented the component symbols' religious connotations to that of 'unity/union', a useful manoeuvre given the genesis of the emblem problem and one which demonstrates symbol indexicality

(see Table 1). Secondly, when seen against the ICRC's brief for a symbol compatible with the ideal of unity (Bugnion, 2000: 32-33), the 'unity/union' connotations chime with another aspect of graphic symbology, that of an 'intuitively knowable' symbol, i.e., 'the viewer can place the correct interpretation on the symbol at first sight' (Foster, 1990: 161). Thirdly, the results of study 4 indicated that the most frequent response to the Crosscent was "don't know" (45.5%); this suggests that there is adequate scope for it to "take on" meanings relevant to the movement. In sum, the Crosscent presents fewer negatives with respect to the movement's needs. Regrettably, despite several approaches to the ICRC to inform them of this project, we have not received a response of any kind.

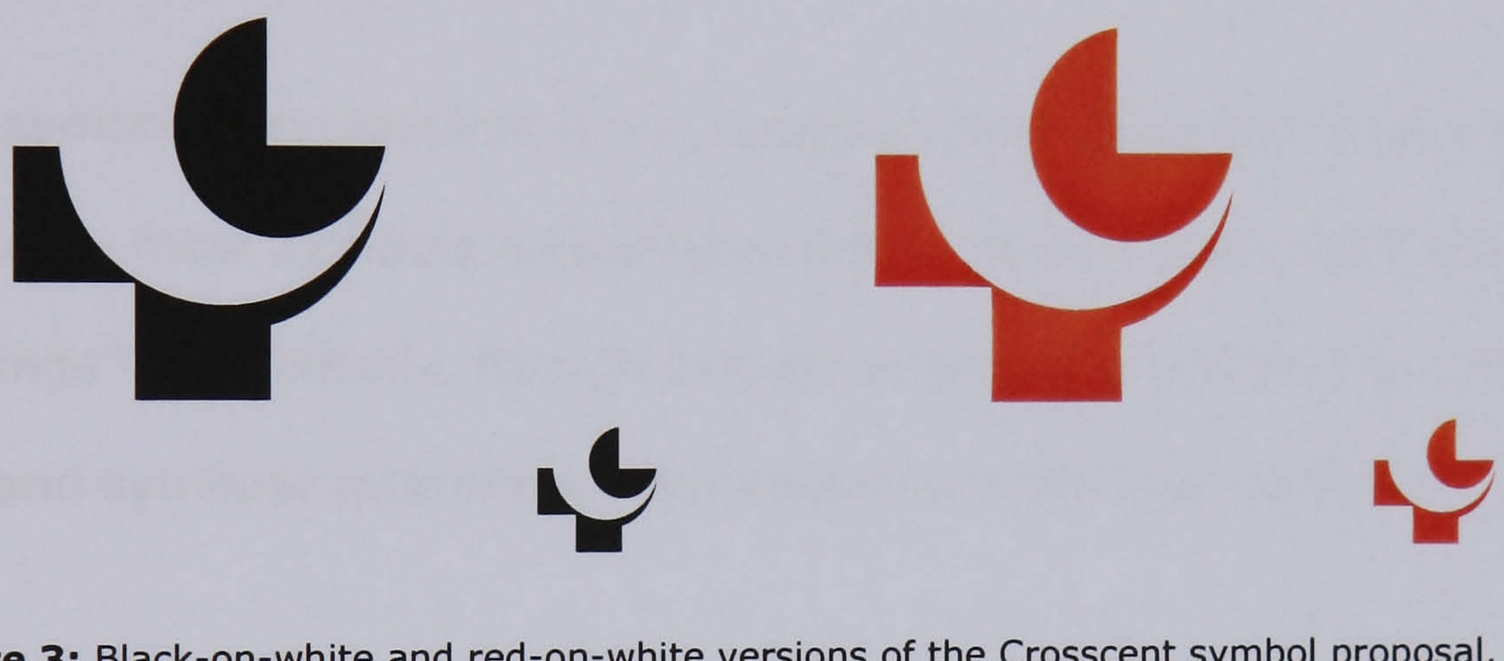

Figure 3: Black-on-white and red-on-white versions of the Crosscent symbol proposal.

The results here indicate that ISO 9186: 2001 is adequate to the task of evaluating symbols other than those in the public information and safety symbol domains. There is however one caveat: the to-be-represented entity would have to be amenable to decomposition into specific referent propositions. This research demonstrated how this could be achieved, by identifying the movement's core attributes and proposing them as the symbol referents.

6 Conclusions

At the referent denotation level, pictorial-to-abstract differences between symbols appeared to act as indexes of the semantic polarity of the attributes (concrete-to-abstract referent language), a likely case of causality with respect to graphic

images. To paraphrase Peirce (Hoopes, 1991: 240), without the respective pictorial-to-abstract graphical forms and concrete-to-abstract attributes, there would have been probably no correspondences approximate to those demonstrated here. However, the symbol-attribute couplings were facilitated most probably by the visual *and* verbal resonances between pictorial symbols and concrete attributes, and between schematic and abstract symbols and abstract attributes. Hence the signifier-signified couplings did not appear to be arbitrary; rather, they were visually *and* semantically motivated, suggesting iconic semiosis. Thus at the referent denotation level, pictorial, schematic, and abstract symbols appeared to be simultaneously, albeit indivisibly, indexical and iconic.

At the symbol interpretation level, graphical form appeared to be a theoretical construct – most symbols appeared to signify some "meanings" iconically and some "meanings" symbolically, though respective symbol semiosis (i.e., the proportion of iconic and symbolic interpretations) varied for individual symbols.

Our findings suggest that symbols of differing graphical forms function in broadly similar ways. Therefore, symbol semiosis, rather than graphical form, would appear to be a more practical and ecologically valid, albeit complex, method for deciding the type of symbol one would use to communicate specific types of messages. The implications for practice are apparent. In the safety symbol domain for example, where unequivocal communication of information is critical, one would want to leverage *iconic symbol semiosis*, irrespective of whether the graphical form of the symbol was pictorial, schematic, or abstract. The iconic symbol semiosis model relies on a visually analogous symbol-referent relationship. This would reduce, conceivably, occasion for incomprehension and misunderstanding. The traffic signing connotations engendered by the abstract Heart and Crystal, though inappropriate in this case, nonetheless indicate that conventionalised abstract symbols are capable of encapsulating and communicating consistent messages

once these massages have been learnt. Thus, *symbolic symbol semiosis* would serve well in new domains or areas of application. Leveraging *indexical symbol semiosis* would be a useful tool in the corporate identity field, for instance. Changes in vision, strategy, ownership, and fashion dictate the pace and scope of re-branding, hence the indexical symbol semiosis model relies on the amenability of this class of symbols. Our analysis suggests indexical symbols are unencumbered by the necessity of a visual or conventionalised analogue between symbol and referent which tends to fixate the symbol-referent relationship – new readings and meanings identifiable with the corporate entity in its evolving manifestations are thus remote. Thus, the signification of unity by the Crosscent in study 4 (as distinct from responses to the individual Cross and Crescent symbols) demonstrates an instance of indexical symbol semiosis.

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Notes

[1] The movement comprises the International Committee of the Red Cross (ICRC), the International Federation of Red Cross and Red Crescent Societies, and autonomous National Red Cross and Red Crescent Societies (there were 181 of these at the time of writing this article).
[2] Email from Dr. Jeremy J. Foster, Manchester Metropolitan University, to Havi Murungi in response to the Red Crystal proposal, 8 February 2002.
[3] Page references to web-accessed documents correspond to the pagination of A4 Microsoft Word printouts of the documents.

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